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JOURNAL OF MAMMALOGY

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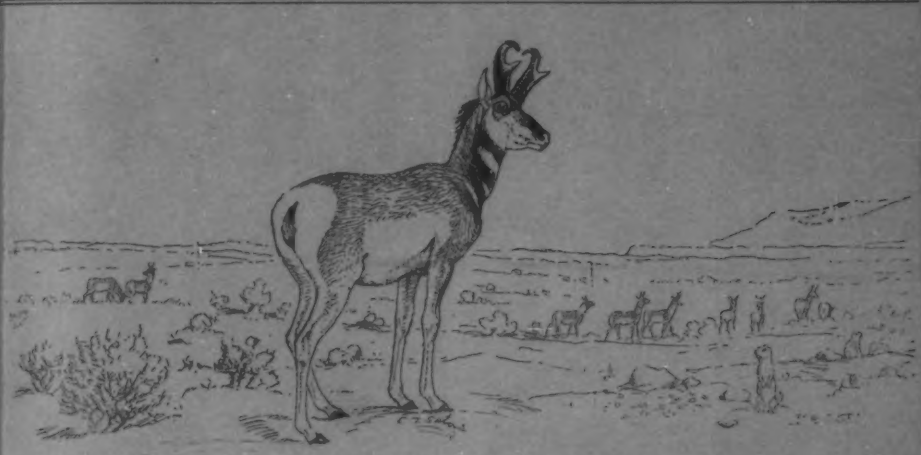

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THE FUR TRADE AND THE FUR SUPPLY

BY F. G. ASHBROOK

Prior to the world war the international fur trade was handled in Great Britain and Germany. A considerable part of the American furs was shipped abroad and American buyers went to London and Leipzig to procure these furs among others gathered from all parts of the world. At the outbreak of the war importations of furs were reduced to a minimum, and American firms as well as foreign branch houses started dealing in the American product. The effect of the war on the fur trade was, therefore, revolutionary and commercially worked to the advantage of the United States.

Prior to the war, also, auction sales of furs had been held in London, but owing to difficulty in transportation as a result of the war, these sales began to be held in this country. Conditions have actually been reversed, and now not only does the American trade purchase American furs in American markets, but foreign dealers ship considerable portions of their annual collections to the American auction sales, and foreign buyers travel to the United States to purchase their supplies.

The fur auction sales held in St. Louis and New York City are of great importance to the American fur trade. The first St. Louis sale, held in 1915, amounted to considerable less than $1,000,000, whereas the 1919 winter sale returned $7,924,330, and the sale held in the winter season of 1921 netted on a declining market $11,000,000. The first New York sale, in 1916, returned about a quarter of a million dollars, while the winter sale of 1919 totaled $6,000,000; the winter sale of 1921 on a low market netted $2,000,000. These figures give an idea of the tremendous offerings at these sales.

FUR TRADE STATISTICS

While statistics are wearisome and are generally taken with mental reservation, yet they serve in helping one form an opinion of the proposition in question. Statistics compiled by the United States Bureau of Foreign and Domestic Commerce show that imports of furs and undressed fur skins during the calendar year 1920 were valued at $84,427,592 as compared with $69,289,909 in 1919 and $32,158,939 in 1918. The value of imports for the calendar year 1920 shows an increase of approximately 22 per cent. Imports of dressed furs and manufactures of all kinds for the calendar year 1920 aggregated $9,131,348 as compared with $7,472,336 in 1919 and $2,491,278 in 1918. The increase for the calendar year 1920 amounted to approximately 22 per cent, or about the same as for the imports of raw furs.

Exports and manufactures of domestic furs for the calendar year 1920 were valued at $32,886,995 as compared with $23,788,599 in 1919 and $11,374,174 in 1918.

The Fur Dressers' and Fur Dyers' Association dressed, during the year 1918, $35,212,230.28 worth of skins; in 1919, $51,366,253.14 worth; and in 1920, $52,910,589.43 worth.

The Board of Trade of the Fur Industry of the United States estimates the annual turn-over in the fur business for the year 1918 at $232,748,201.86; for 1919, $342,441,687.60; and for 1920, $352,605-927.18. It is interesting to note here that the revenue accruing to the Federal Government from articles made of fur during 1920, on which there is a 10 per cent revenue tax, amounted to $15,311,214.24.

The statistics which have just been enumerated furnish a fair estimate of the volume of the fur industry in the United States. It will be understood, however, that these figures are not immune to criticism; yet they are as correct a representation of the financial phase of the fur industry as it is possible to obtain under existing conditions.

DEVELOPMENT OF THE FUR TRADE

The modern fur trade has developed in the past twenty-five years from a neglected, unimportant industry into one of the largest and most important in existence. The United States has grown to be the largest fur market and fur-consuming country in the world. The fur industry employs many thousands of men and women who make their living from furs and in turn contribute to the comfort of a great number of people.

An industry the finished product of which is so much in demand scarcely needs any further argument for permanent existence. Large industries always have important problems to meet and solve and the fur business is by no means an exception. During the past year the fur trade has been confronted with a number of very important issues. It has been demonstrated that the American fur supply can not be controlled by any single interest, that wild speculation meets with disaster, and that unhealthy competition has no place in the fur business. An all-important question still remaining unanswered concerns the future of the fur supply.

PROBLEMS TO BE SOLVED

If the fur industry is to progress along safe and sane lines, the source of supply should be more definitely assured. This is indeed a very difficult problem, but not impossible of solution; while it is mainly an economic problem, it can not be solved by the trade alone. Neither will the utterances of radical conservationists of wild life assist very greatly in solving the problem. Conservationists of this class generally have a few pet fur bearers in mind and are prejudiced regarding the others. They are satisfied with saying that the future of the fur trade rests entirely with those engaged in the industry. It is foolish to believe that a business of such proportions as the fur industry is not interested in conserving the source of the raw product. A number of raw-fur concerns have been for some time talking conservation and correct legislation for the protection of the fur bearers. Practically all believe that an educational campaign is the only means of bringing results. Some raw-fur dealers have argued the question before their state legislatures only to have their propositions defeated. Others have sent literature to farmers and trappers in various sections of the United States, with a view of educating them to protect and conserve the fur-bearing animals.

The Federal Government, state legislatures, agricultural colleges, and societies interested in the preservation of fur bearers should all lend assistance along practical lines in bringing together the interested parties to solve the problems regarding the source of supply. Intelligent work and cooperation of everyone concerned is necessary to retain permanently all species of fur bearers and not to jeopardize the fur industry.

LEGISLATION

Adequate laws for the protection of fur-bearing animals are indeed very necessary and helpful; but the majority of those now on the statute books do not prevent the decrease of animals in certain sections of our country, neither do they prevent the taking of young animals and unprime pelts, which are practically valueless to the fur trade. Approximately 45 to 55 per cent of the pelts coming to the markets fall into the unprofitable class. Fur of superior quality and more of it would come to the raw fur markets if open seasons were made uniform for states where similar climatic conditions prevail.

Every state should require trappers to take out a trapping license, and in addition every trapper should be bound to turn in to the game warden under oath a report of his catch for the season. The renewal of a permit should be withheld until such report is made. With legitimate trapping under wise laws, the fur supply of our country will not be materially affected.

Areas in which fur bearers have become depleted should be closed completely for a period of years and, so far as may be consistent with the interests of game birds and animals, these regions should be restocked. The national forests furnish excellent breeding grounds where fur bearers can reproduce unmolested, and stock from these breeding grounds could well supply depleted areas. In restocking there is always the possibility that the fur bearers will become pests to the neighboring landowners. This can be overcome, however, if the number of breeding animals is kept constant by proper trapping each season, or oftener if necessary.

There should be cooperation between the Federal and State Governments and the fur trade in framing suitable laws, which are very necessary to place the fur-bearing animals and the fur industry on a sound basis.

NEED FOR EDUCATION

Lack of information on the part of farmers, trappers, and legislators is mainly responsible for inadequate laws pertaining to fur bearers. Many persons do not know that fur-bearing animals are a great asset to a state, and have no idea concerning the annual income derived from pelts produced in their particular state.

Two years ago the raw-fur dealers of the State of New York employed counsel and went to considerable expense to defeat legislation authorizing the hunting of raccoons beginning October 1 instead of November

15. They were unsuccessful and now the hunting of raccoons is authorized in New York to begin on October 1. Raccoon skins taken during October are practically valueless, and a useless waste of fur is the result of trapping under this legislation.

In order to bring about suitable legislation it seems very necessary to launch an educational campaign through state institutions and state societies to cover the entire country. The Biological Survey of the United States Department of Agriculture is in a position to direct such a campaign for the reason that it is deeply interested in the practical conservation of fur bearers and in the future of the fur industry.

If laws such as are herein suggested were passed in the various states, the fur-bearing animals would be conserved on a sane basis. Proper legislation would do more than this—it would for the first time give us an approximate number of the various pelts trapped annually in the different states. The importance of such statistics can not be overestimated. We would then have a firmer foundation on which to base arguments for or against conservation of certain species. The tremendous offerings by the fur auction-sales companies in the United States can not be considered an index of the animals trapped yearly in this country. Muskrat skins to the number of 1,144,016 offered at a single auction make indeed a tremendous figure, but this does not tell the whole story. The chances are that this offering consisted of more than one season's catch. When pelts are received at the raw fur houses they enter into the trade, pass from hand to hand, and undergo a change so complete that their identity is practically lost. It is, therefore, impossible to distinguish with any degree of certainty between muskrats, minks, or foxes originating in the United States and those originating in Canada or any other country.

REARING FUR BEARERS IN CAPTIVITY

The breeding of fur-bearing animals in captivity and the stocking of the national forests and game preserves are enterprises that should be encouraged. The production of foxes, skunks, beavers, and muskrats has proved successful when intelligently managed. The reason this phase of the fur industry has not met with greater success is because there has been too much publicity concerning financial returns and too few warnings to ranchers of pitfalls and obstacles to be overcome.

Inferior animals, temperament, feeding and breeding problems, sanitation, diseases, and parasites all raise questions to be faced by the average stockman and farmer. Every person engaged in the rearing

of fur-bearing animals will meet these same problems sooner or later, and success in the business depends largely on just how completely they are solved. A rancher must further consider that he is handling wild animals in captivity and not domesticated stock in the ordinary sense of the term. It is very true that fur bearers born in captivity are more docile than those from the wild, but they are not in the strict sense of the word fully domesticated.

A knowledge of pelts, pelt values, and market requirements is an additional requisite a fur farmer should possess in order to operate his business intelligently. His harvest is pelts, and he should be well informed as to primeness and quality of fur as well as to market requirements.

A number of raw-fur buyers claim that fur produced on ranches is not popular with the fur trade because it is unprime and lacks the quality and finish of wild fur. This is absolutely untrue, for practically all the silver fox pelts on the market are taken from ranch-bred stock.

The Biological Survey is endeavoring to keep an up-to-date list of persons engaged in rearing fur-bearing animals, in order to be in close touch with the business. It may be interesting to learn that its records show at present 500 breeders engaged in rearing one or more species of fur-bearing animals. The list is as follows: Silver foxes, 265; red and cross foxes, 74; blue foxes, 1; skunks, 81; raccoons, 24; minks, 20; muskrats, 10; opossums, 9; martens, 7; squirrels, 3; beavers, 2; fishers, 2; Russian ermines, 1; and badgers, 1. Although this list for the United States is not complete, it gives a fair idea of what is being accomplished.

The rearing of fur-bearing animals in captivity is practically a new industry, and many people engaged in the business know little if anything about it. The information at hand on this subject is very meager indeed; hence most persons are very shy in answering questions relating to the production of fur-bearing animals. State agricultural colleges and experiment stations and state game commissions and conservation societies should promote the raising of fur-bearing animals in captivity. Extensive investigations along the line of feeding, breeding, and management should be made as well as with regard to diseases and parasites.

CONCLUSION

Too much stress can not be laid on the value of the fur industry in producing a most important article in our domestic as well as in our

foreign trade. Prior to the world war, the world's fur market was in Europe, but since then it has been transferred to the United States.

The largest fur sales in the history of the world are held in St. Louis and New York City. The winter sale held in St. Louis in 1920 totaled $27,102,588. Ever since the world began, people have worn furs and they will probably continue to do so indefinitely. The fur business, therefore, has good reason for existence.

Information regarding seasons when pelts are prime is necessary for trappers and state legislators in order that the trapping seasons of practically all fur bearers may be properly limited. It is also essential to establish close seasons for certain fur bearers that need this protection. Enforcement of such laws will most certainly prove very effective in conserving the fur-bearing animals, thus establishing the future of the fur trade.

Fur farming is a commendable and hopeful adjunct to the fur industry. Foxes are being raised successfully and the industry has attracted much attention, principally on account of the high prices paid for breeding stock. Skunks, muskrats, and beavers have under certain conditions been raised successfully. Fur farming, therefore, occupies a place in the general scheme of conservation, but the extent to which this industry may become a factor in increasing the production of fur will be determined only by future developments.

Biological Survey, Washington, D. C.

SCATTERED OBSERVATIONS ON NARWHALS

By Dr. Morten P. Porsild

[*Plate 1*]

A peculiarity of ice conditions in Disko Bay, on the west coast of Greenland, is that the ice instead of first freezing over the bay at the heads of the fiords on the approach of winter and gradually spreading seaward, first forms late in December, when the drifting ice of Baffin Bay approaches the coast. The weather then becomes quiet, with intense cold, and ice rapidly spreads over Disko Bay from the islands near its opening inward toward its head.

"Then it often happens," to quote my article explaining the circumstances in the *Geographical Review* (vol. 6, pp 215–228, September, 1918), "that schools of white narwhals are cut off from the still open parts of Baffin Bay, and are gradually driven in towards the head of Disko Bay. Freezing continues, and finally the schools are restricted to the last smaller or larger open spaces in the ice, whence they cannot escape unless the weather changes and the ice is broken." Their presence there will be betrayed by a column of white vapor of their breath, condensed in the extremely cold air; and the Eskimos flock to the place from far and near to kill and capture the animals, which are valuable to them in many ways. Such a pool of trapped whales is called by the Greenlanders a *savssat* (pronounced s'set), a word used of living animals crowded into a small space. It ordinarily happens, however, that these pools themselves soon freeze over, and then the imprisoned animals are compelled to break breathing-holes through the ice, and keep them open, in order to get air. It has been my fortune to see several of these *savssats*, and to witness the slaughter and capture of the whales; and it is from such experiences that I have derived the information given below as to some features of narwhal life and anatomy.

So far as I know, it has not been previously recorded that various species of arctic whales are able intentionally to break holes through the ice for breathing. At the first *savssat* I visited the holes in the morning were from a few to several feet long and from one to three feet broad; by lengthening and merging into each other, the first holes broken developed to cracks. The holes are broken by blows with the thick and firm cushion on the upper side of the head, in front of the so-called "blowing-hole," or exit of the nostrils. The Eskimos at

Godhavn and Skansen, well acquainted with the habits of the narwhal in ice, declare positively that the male carefully guards his tusks from bumping into firm and tough ice. Once Ludvig Geisler, from Skansen, found a single large male sleeping near a lead in very hummocky ice, its mighty tusk projecting out over the surface of the ice and leaning against it. The animal awoke before Geisler could get his rifle clear and very slowly and cautiously drew back the tusk until it was quite clear, when it rapidly dived away.

In the drawing of G. Kleist (cf. Porsild, l.c., 1918, p. 221) illustrating the most ordinary form of *savssats*, may be seen a number of male narwhals emerging from a very small hole with their tusks resting on the surface of the ice. Here natural openings in the ice are gradually diminished by freezing, and the stronger males push away the weaker ones and the females. Eventually the animals become so worn out that they stay at the hole constantly, resting their tusks on the ice, and do not quit it again.

Whales of other species are also able to break breathing holes in ice. It is as common with white whales (*Delphinapterus leucas*) as with narwhals; some natives state that the holes broken by the white whales are a little trapeziform in shape and thus distinguished from those of the narwhals, but others deny this. Giesecke mentions in his diary a case where a harpooned northern right whale ran with the line under the ice and broke ice that was more than a foot thick. Numerous cases of a similar kind are related by him from the hunting of that species at Godhavn in olden time. The humpback whale (*Megaptera boöps*) has ordinarily left the waters of Disko Bay when the ice covering sets in, but sometimes it happens that a single straggler is delayed by the lure of unusually large schools of the polar cod (*Gadus saida*), and thus is surprised by the ice covering. It then breaks open large triangular or trapeziform holes. Some years ago a young specimen had made a trial in very hummocky ice intermingled with calf-ice from collapsed icebergs near my dwelling. It probably had become stupefied by the blow and had died by drowning or from wounds in the head. It was found dead and frozen in the ice by a dog.

It was not possible to ascertain even approximately the ratio between the males and the females, young and full-grown individuals, of the narwhals. Full-grown males with big tusks were most eagerly pursued as long as the animals were numerous. I do not doubt that the number of females by far exceeds that of the males. The ventral side of both sexes was considerably lighter colored than the back, but

the females were as a rule much lighter colored than the males, and in them the light color extended from the whole ventral side up over the flanks.

On several females I noticed wounds two to four inches long near the genital openings. They were narrow, resembling incisions made by a knife, and ran lengthwise of the body. All the wounds that I saw were infested with apparently the same parasite that always infests the fold of the skin about the root of the tusk (*Cyamus nodosus* Lütken). In his monograph of the species of *Cyamus* (Kgl. Vidensk. Selsk. Skr. 5 R. naturv. and math., Afd. 10. Kjöbanhavn, 1873) C. F. Lütken states that he does not yet know whether this parasite occurs only on the male narwhals or not.

Several, but not all the full-grown females were with young. The stage of development of the fœtus of the gravid ones varied greatly, the fœtuses ranging from very small to nearly full-grown. This corroborates previously expressed opinions that a definite rutting season does not exist amongst narwhals.

As is well known, two tusks grow in the upper jaw of both sexes of the narwhals, but as a rule the left one of the male protrudes and develops into the large tusk. Both tusks of the female, and as a rule the right one of the male, remain included in the tissues; but in rare cases both tusks are developed in the males, the right one then often somewhat shorter and weaker than the left one. A specimen with two tusks was seen several times during one of the *savssats*, but unfortunately was not secured.

The undeveloped tusks often show a characteristic appearance, for they are in the process of absorption, especially in old individuals. The surface is then "louse-eaten," say the Greenlanders, who also pretend to be able to distinguish the incipient tusks of the females from the right one of the males, the latter being straight, they say, whereas the former are slightly curved. The small tusks soon become solid. Those of the young individuals are very strong, and are used by the Eskimos as part of their towing implements.

The root end of the developed tusk in young individuals is very thin-walled, but in old specimens this cavity is gradually filled up with very fine bone. The bone of the root end of very old tusks is technically the best of the whole tusk, being not liable to splitting and warping as the other parts often are. However, there is always a thin canal left, leading up to the large cavity running through the whole length of the tusk. When uninjured this cavity is filled with a spongy core, rich in blood.

The distal part of every protruding tusk, as well in the young as in the full-grown individuals, is white and polished. In the rare cases of two developed tusks, sometimes the right one is shorter, but its distal part is polished to the same distance from the point as the other. From the polished point towards the base, the spiral furrows always show a dense red-brown or greenish algal growth, heretofore not mentioned. According to an investigation kindly made by Prof. L. Kelderup Roseavinge at Copenhagen, this alga is a sterile species of *Rhodochorton* probably *Rh. rothii* very common along the shores of Greenland. Several diatoms not determined were also found by me.

The tusks of a large number of old males are broken at various distances from the point. Of 314 specimens seen at one time by the late Prof. H. Jungersen, 107 were broken. The cavity is opened by the breaking, and the blood-filled content gradually oozes away. The broken end with its spirals becomes worn, the algal growth on the outer surface disappears, and the sharp edges of the fracture are smoothed and polished; often the algæ also develop a short distance into the cavity. The strangest feature is, however, that not seldom *a point of another smaller tusk is found thrust into the cavity and then broken off*, a real "tooth-filling." The occurrence of this strange phenomenon is well known to the Eskimos of Greenland, who tell wonderful tales about it. They say an old male with a broken tusk entices a younger one to thrust its tusk into the cavity, whereupon by a jerk, it breaks the tusk of the younger narwhal. Robert Brown (Proc. Zool. Soc., London, 1868, p. 90) says; "They seem to fight with them; for it is rarely that an unbroken one is got, and occasionally one may be found with the point of another jammed into the broken place, where the tusk is young enough to be hollow or is broken near enough to the skull."

Of "filled" specimens I have seen four, two at Godhavn, the best of which is here figured (plate 1). Another pair was kindly shown to me by Mr. J. Krogh, chief factor of the colony of Jakobshavn. All specimens were sent to the Zoological Museum at Copenhagen. Among the specimens seen by Professor Jungersen one was remarkable, as the filling was broken in the cavity of the larger tusk, *not reaching its outer end*. Thus it could not be pulled out, but only taken out after sawing.

A fight between narwhals has never been observed by the Eskimos of my acquaintance. They declare the narwhals to be peaceful and well-behaved animals. If fighting amongst males regularly takes place, one might expect to find their heads scarred and wounded, but neither I nor my Eskimo informers ever saw this. In one of the cases I have

seen, the filling was jammed so solidly that it could be pulled out only with a pair of tongs, and under the filling was found a wing-feather of a guillemot. I must confess that I am at a loss to understand how that curious filling is effected. The fact seems to have been observed at a very early date. The learned Danish historian of the seventeenth century, Olaus Wormius, wrote several papers about the true nature of what was then styled "Unicornu." I owe this information to the late Prof. H. Jungersen of Copenhagen, who had promised to renew the histological and zoological investigation of the "filling." Since he was prevented in so doing by his premature death, I feel free here to quote part of his letter, hoping that some other zoologist will take up the question. I do not have access here in Greenland to the works of the elder authors mentioned hereafter, and thus can not prosecute the investigation of the older literature myself.

Professor Jungersen writes:

I have not yet succeeded in finding the *ipsissima verba* of Wormius; I am acquainted only with the resumé given by the Dutch author, Claas Mulder, 1835, of La Peyrère's account of 1678. In translation it reads as follows: "La Peyrère narrates that he heard from the Chancellor of the Kingdom of Denmark that the king of this country wished to present as a gift to some one a fine specimen of a Unicornu, and therefore had an entire horn sawed through at its thickest end. It was supposed to be quite solid, but it was found to be hollow. To the greatest surprise of all, a small horn of the same shape and quality as the big one was seen in the cavity. Further, the sawer cut the big horn through across without damaging the small one, and it was noticed that the small one was concealed in the big one as far as the cavity extended. . . . . I think it is the same case mentioned by Wormius. He mentions the Royal Apothecary, Elias Fleischer, who sawed the tusk for him, and who by vigorously shaking and pushing succeeded in getting the small tusk out. Wormius adds that he never before observed a case like this, although he had seen many narwhals' tusks."

As far as I can see, Mulder has however never seen the writings of Wormius. La Peyrère owes his knowledge to Wormius, either from his writings or his correspondence.[1] I have hitherto not been able to find the quotation myself; all our old literature being at this moment in the hands of Dr. Garboe, who at present is studying all the tales of the olden time about the "Unicornu."

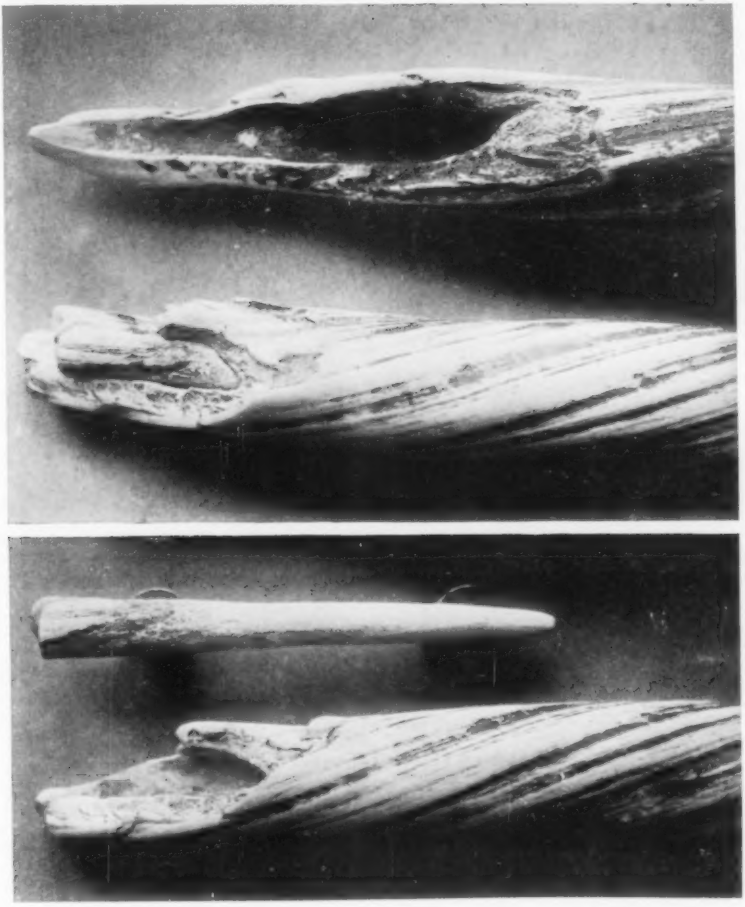
If La Peyrère relates rightly, that "small horn" is however very enigmatic, reaching down to the very base of the large tusk. Old Peter Camper has, on

[1] Or from verbal information. La Peyrère visited Copenhagen, 1644–45, in the suite of the French ambassador. He became a friend of Wormius, studied in his famous "Museum" and got from him most of the materials for his books: *Relation de Groenlande* and *Relation d'Islande*. Cfr. C. C. A. Gosch: Udsigt over Danmarks zoologiske Literatur, 2. Afd., I, Bd., P. 29.—M. P. P.

A

B

C



BROKEN AND FILLED NARWHAL TUSKS

A.—A large broken tusk, not "filled." The bloody contents of the cavity have disappeared; the algal growth has developed over parts of the fracture and into the cavity; the point is worn and white, its edges smoothed. *B*.—A strong tusk broken and afterwards "filled." The sharp edges of the fractures worn and smoothed. *C*.—The same specimen with the "filling" pulled out.

the basis of this account, invented the story about a shedding of the teeth. Nowadays it is well known that neither the narwhal nor any other Cetacean sheds the teeth.

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NOTES ON NEW HAMPSHIRE MAMMALS

By C. F. Jackson

During the past few years an attempt has been made to collect complete data concerning the distribution and relative abundance of the vertebrates of New Hampshire. In making this survey some very interesting mammals have been discovered which were thought to have been driven out of the state or exterminated long ago.

Perhaps the most interesting discovery is that of a pair of cougars whose range extends along the east side of the Androscoggin River in the town of Cambridge to the southern shores of Lake Umbagog. Records of the occurrence of this species in recent years are very meager. For the southern part of the state below the White Mountains, the latest record I can find is that of a large male which was shot near Epping, New Hampshire, in 1870. In 1885 a specimen was taken in the White Mountains which is the latest record I have for the state. Rumors have been heard from time to time of the cougar occurring in Maine and in the Green Mountains of Vermont.

Dr. E. W. Nelson of the Biological Survey has referred me to two records, one from Vermont and one from Maine. The latest Vermont record is furnished by Merriam in the Proceedings of the Washington Academy of Sciences (volume III, 1901, page 582). According to this record the last one killed was in 1894. In the same letter Doctor Nelson referred me to The American Field (volume 66, page 400); which cites the killing of a panther in Maine near Mount Kineo in 1906.

It would seem that the species has been able to survive in the less frequented portions of Maine.

It is not known whether the two panthers referred to above are male and female, although this is probably the case. One was seen at very close range by Mr. H. T. Woodward of Berlin and was thought by him to be a male.

A second unusual species is the wolverine, a pair of which were found in 1918 in the Diamond region east of the Connecticut Lakes. Two young animals were taken, which would lead one to believe that the species was breeding to a certain extent within this wild region.

The beavers, which have always persisted, are now represented by two rather prosperous colonies in the Diamond region. In addition to these the work of isolated individuals is occasionally found on both the Dead and the Swift Diamond and their tributaries.

The otter is also found, particularly in the northern parts of the state, although the species is rapidly being exterminated.

At present the authentic record of New Hampshire mammals occurring within the state during the past five years, includes all the large species known to have occurred formerly with the exception of the timber wolf, the northern gray fox and the woodland caribou.

The last record in my possession of the timber wolf is that of a specimen taken in the White Mountains in 1887. In regard to the northern gray fox, the only record which I have is that of the type specimen described by Merriam in 1903, which was taken at Marlboro, New Hampshire. Tracks of a small herd of four woodland caribou have been reported from near the Canadian line in the Connecticut Lake region by an old trapper. This report, however, has not been confirmed. While a specimen was obtained in Houlton, Maine, in 1893 and tracks seen as late as 1896 (Recreation, volume IV, 1896, page 140) no caribon are known to have occurred within this state for a number of years.

The following is a preliminary checklist of the mammals known to have occurred within the state during the five year period from 1915 to 1920. The list is exclusive of the families Muridæ and Zapodidæ, and the orders Insectivora and Chiroptera. Sufficient collecting has not as yet been done to make even a preliminary report on these groups.

1. **Phocæna phocæna** (Linn). Common Harbor Porpoise.—Comparatively abundant off Portsmouth Harbor.

2. **Odocoileus virginianus borealis** (Miller). Northern Virginia Deer.—Common throughout the state.

3. **Alces americanus** Jardine. Moose.—Found only rarely in the northern part of Coos County.

4. **Sciurus hudsonicus** (Erxleben). Northern Red Squirrel.—Very common in the northern part of the state.

5. **Sciurus hudsonicus loquax** Bangs. Southern Red Squirrel.—Common throughout southern part of the state.

6. **Sciurus carolinensis leucotis** (Gapper). Northern Gray Squirrel.—Common throughout southern two-thirds of the state.

7. **Tamias striatus lysteri** (Richardson). Chipmunk.—Locally common throughout the state.

8. **Marmota monax preblorum** Howell. Woodchuck.—Very common throughout the cultivated regions.

9. **Glaucomys sabrinus macrotis** (Mearns). Canadian Flying Squirrel.—Found locally in the northern part of the state.

10. **Glaucomys volans** (Linn.). Southern Flying Squirrel.—Found occasionally in the southern part of the state.

11. **Castor canadensis** Kuhl. Beaver.—Two colonies in the northern part of Coos County.

12. **Erethizon dorsatum** (Linn.). Porcupine.—Fairly common throughout the northern two-thirds of the state.

13. **Lepus americanus virginianus** (Harlan). Varying Hare.—Very common locally throughout the state in mountainous parts; abundant near tree line.

14. **Sylvilagus transitionalis** (Bangs). Northern Coney Rabbit.—Abundant south of White Mountains.

15. **Phoca vitulina** Linn. Harbor Seal.—Usually three or four are found during the winter in Great Bay.

16. **Felis couguar** Kerr. Cougar.—Two individuals as noted above.

17. **Lynx canadensis** Kerr. Canada Lynx.—Occasionally found from White Mountains northward.

18. **Lynx rufa** (Schr.). Bobcat.—Fairly common throughout the wooded parts of the state.

19. **Vulpes fulva** (Desm.). Red Fox.—Common throughout state.

20. **Lutra canadensis** (Schr.). Otter.—Very rarely found. In the northern part of the state.

21. **Mephitis nigra** (Peale and Beauv.). Eastern Skunk.—Locally abundant.

22. **Gulo luscus** (Linn.). Wolverine.—As noted above.

23. **Mustela vison** Schr. Mink.—Occasionally found throughout the state.

24. **Mustela cicognanii** Bon. Little Brown Weasel.—Quite common throughout the state.

25. **Mustela noveboracensis** (Emmons). Large Brown Weasel.—Fairly common in the southern part of the state.

26. **Martes americana** (Turt.). Pine Marten.—Found occasionally in the northern part of the state.

27. **Martes pennanti** (Erx.). Fisher.—Found rarely in the northern part of the state.

28. **Procyon lotor** (Linn.). Raccoon.—Occasionally found in the southern two-thirds of the state.

29. **Ursus americanus** Pallas. Black Bear.—Rather common in the White Mountain region and the northern part of the state.

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CONCERNING LICE

By G. F. Ferris

Probably every collector of mammals has occasionally noticed the lice that usually come out to the ends of the hairs of a mammal within a few hours after it has been killed. But that very few mammal collectors have ever taken any particular interest in these parasites is sufficiently attested by the infrequency with which they are received by entomologists and the paucity of information concerning them. And, indeed, why should mammalogists take the time to collect a group of insects that have had little enough attraction even for entomologists and that are usually spoken of in our entomological texts merely as "disgusting parasites," illustrated by one or two crude figures and grudgingly accorded a page or two of passing mention?

Yet these parasites are really of sufficient interest to merit something more than this scanty consideration. Rather than the apology for studying them, which prefaces a certain old book, there should be an apology for not studying them more. Aside from the importance accorded to the notorious "cooty" because of its disease-transmitting proclivities there are other factors that may justly entitle them to some share of our attention. The special interest of the lice in general lies in the fact that they may be made to contribute some small addition to the mass of evidence upon which our theories of evolution are based.

No one can study these insects for any length of time without being struck by certain peculiarities in the distribution of the various groups and even of the various species. Here are a few of these peculiarities, chosen more or less at random. What is the explanation of them?

The various species of *Microtus* and related genera, both in Europe and North America, have upon them the same species of louse. There are upon the various species of *Citellus* and related genera in western North America two species of lice that are apparently identical with two species which occur upon at least some of the Siberian species of *Citellus*. There is upon the llama in South America a very peculiar louse that appears to be identical with one which was originally described from the camel. There occurs upon the California sea lion a louse that is found also upon another Otariid in the Antarctic region, although these two mammal species are separated by at least the width of the tropics. There is upon the harbor seal of the California coast a louse that occurs also upon the various species of *Phoca* in the Atlan-

tic, although these seals have not had the advantage of any modern Panama Canal.

Another aspect of the same phenomenon appears when we consider the distribution of related species of lice. The nearest relative of the louse of the domestic pig is found upon the wart hogs and bush pigs of Africa. The Sciuridæ may boast of the possession of three genera of lice of which two are known only from squirrels, upon which they may be found wherever squirrels are found. The other genus is found also upon the Muridæ. The lice of the monkeys find their nearest relatives in the lice of man.

It is in fact a general rule—to which there are by all means exceptions—that a single species of louse will be found only on closely related hosts and that related species of lice will be found on related hosts.

I have said that there are exceptions to this rule, and some of them are glaring enough. One such exception is the occurrence upon *Sorex araneus* (the only Soricid that is known to possess lice) of a species that is identical with or at least very closely related to a species that occurs also on the domestic rat. Another is the occurrence upon the domestic dog and also upon foxes of a species the nearest relative of which is another species found upon the domestic sheep. And what are we to say of the louse which appears to be normal to kangaroos but which has once been taken from a dog in Africa, twice from dogs in, and once from a coyote near, San Francisco and once from a man in the Federated Malay States?

Aside, however, from these and some other disturbing exceptions the facts are fairly harmonious and their broader implications are fairly evident. It would seem that the normal occurrence of a common parasite species upon two or more geographically separated but genetically related host species may adequately be accounted for only by the assumption that the common ancestor of these hosts had upon it this same parasite species. In a manner of speaking the occurrence of the parasite upon these different host species is a part of their racial inheritance. It requires only an extension of this theory to account as well for the occurrence of related parasites upon related hosts. In fact it appears that in general the problem of the geographical distribution of the parasite species is to a very considerable degree bound up with the problem of the relationships of their hosts.

Now if we attempt to push this theory to its apparently logical conclusion we shall be led to the assumption that the original ancestor of all the mammals had upon it the original ancestor of all the lice. I

hasten to abjure any thought of such a conclusion for there are a considerable number of factors which need not be considered here but which will doubtless operate effectually to negative the apparent logic of the situation. In fact it would be a most extraordinary thing if even the roughest approximation to such a conclusion could be obtained. But how far can the theory reasonably be pushed? At what point will we be compelled to witness that "saddest of all spectacles, a beautiful theory slain by a fact?"

The only way to answer such questions is by the examination of a complete collection of the parasites of all the mammals, and the obtaining of such a collection is no easy matter. An approximation to a complete collection from the smaller mammals may eventually be obtained by the examination of the skins in the collections of our museums. The present writer, through the kindness of the authorities of the National Museum and the Field Columbian Museum, has been permitted to examine the collections in these two museums with most gratifying results. Just how gratifying the results were may be judged from the fact that when the work on the material thus gathered is complete our knowledge of these parasites will be more than doubled. But the parasites of the larger mammals can not be procured in this manner for the tanning and cleaning of the skins leaves at the most nothing but an occasional egg glued to a hair to tantalize the enthusiastic louse collector with visions of what previously must have been there.

It seems that the only way to obtain material from the larger mammals is through the interest of those by whom they are killed and it is with the hope of arousing this interest that this note is written. How scanty our information concerning the parasites of the larger mammals is may be judged by the fact that of North American mammals alone we do not know any of the lice of the caribou, elk, moose, bison, musk ox, bears, wolves, wolverine, otter, fisher or any of the cats other than the wild cat. In other words our ignorance of the lice of the larger mammals is almost complete.

The rapid disappearance of these larger species makes it imperative that anything that is to be done shall be done soon and this is an appeal to those who may have an opportunity to examine any of these larger species to do so. But little care is necessary in preserving material, dried specimens being as valuable as any others. A few lice entangled in a mat of hair and dropped into an envelope may serve to fill up the gaps in our knowledge and reduce the list of host names in the "unknown" column.

Stanford University, California.

SURFACE WANDERINGS OF FOSSORIAL MAMMALS

By A. Brazier Howell

The writer had always thought it an accepted theory that certain fossorial mammals move about on the surface of the ground to some extent, but recent enquiry among mammalogists has brought to light considerable skepticism on this point. Published proof is meager, and the most conclusive evidence that has yet appeared seems to be that presented by Dr. H. B. Bryant (Univ. Calif. Pub. Zool., XII, 2, 1913, pp. 25–29), who found a number of gophers that had been caught in a gutter full of tar. It may be argued that these animals were forcibly driven from their burrows by a flood of irrigation water; but, under the circumstance, it is more likely that the advance of the dry season had rendered the soil in which they were working too hard for their taste, and that they were seeking new pastures.

For ten years I lived on my orange grove at Covina, Los Angeles County, California, where gophers (*Thomomys bottæ pallescens* not typical) were so common that I have taken 300 on ten acres within six months. During the greater part of the year the ground was scrupulously and finely cultivated, and not a weed allowed to grow; hence, gopher mounds were readily found as soon as formed. One of our chief cares was to find every one of these animals that entered the grove from the surrounding territory and catch it at once. As there were no other growing things, each gopher invariably made for an orange tree to feed on the tender bark of the roots, and if he happened to strike and girdle the tap root, sixty dollars worth of damage was done. So one may well believe that we exercised the utmost vigilance to keep the grove free from these pests, and except during the winter, when a leguminous cover crop was grown, mighty few gophers remained undetected upon the ranch for more than twenty four hours. For this reason, it was impossible for a gopher to work its way, underground, into the center of the grove before it was discovered. They habitually entered from a piece of uncultivated land on the south; from a pasture on the east, for the most part unirrigated; and from the weedy borders of a highway on the west. Of course, the usual mode of entry to the property was by short extensions of the burrows until the boundary was crossed, but in at least two score instances, their workings suddenly appeared from a few yards to as much as 380 feet from the nearest cover. And at that, they traveled over bare ground, where, one would imagine, there would be slight attraction to lead them on. Six or eight

times we have, when attending at night to some such activity as fumigation, encountered lone animals meandering about through the trees and far from any possible burrow. Nor have I taken into account those animals found on the move during the monthly irrigation, for then they are flooded out and will make for the nearest dry ground.

On my ranch near Calexico, Imperial County, California, the pale *Thomomys perpallidus albatus* is abundant, but in this locality the gophers live only in the banks of the larger irrigation ditches, where they are at all times out of reach of flooding. They never enter the fields for more than a few feet, for in summer these are thoroughly irrigated at least every ten days and sometimes oftener. My foreman is occupied with irrigating a great deal during the night, and he informs me that he often finds gophers wandering about well away from burrows, and in situations that would preclude the possibility that they had been flooded out.

The habit of *albatus* in apparently instinctively shunning ground that will shortly be flooded is worth noting in comparison with that of the Covina animal, which latter will readily seek the lowest spots, from which they are regularly driven by water. Under original conditions, *pallescens* was never troubled by too much water, except in very rare conditions, as when a cloudburst would drive a few unlucky animals onto higher ground. On the other hand, *albatus* was originally confined to the bottom lands along the lower Colorado River. At stages of low water the most attractive habitat was undoubtedly the lower association close to the river, as the herbage there would be of a more luxuriant character. However, such animals as obeyed this urge would invariably be flooded out and drowned by the annual high water conditions. Hence, along the river, they seem to be, or rather, they were, a number of years ago, found only in those situations that are seldom or never subject to such perils. In the recent extension of range of these animals into the Imperial Valley, their movements are apparently actuated by the same caution in regard to water. Call it instinct or what you will.

It is well known that pocket gophers will make excursions of several feet from their burrows, even in the daytime, after especially attractive food, but they usually prefer to burrow under their larder, and will thus hollow out a large squash or pumpkin from beneath, leaving no external signs of the depredation. Very young animals are sometimes observed sunning themselves near the entrances to the tunnels in the most unconcerned manner, but such actions are probably due more to curiosity than to anything else.

It seems to be the accepted theory that most of the surface traveling indulged in by gophers is undertaken by old males in search of mates. However, while the males will undoubtedly seek out the females, either below or above ground, by far the majority of proven cases of emigration of which I know have consisted either of females or of half grown animals. The old males, being larger (in many forms) and better fitted to cope with adverse conditions, such as hard digging through the drying soil for a failing supply of food, are probably more prone to remain in one spot than are the smaller, weaker individuals. At any rate, but few pocket gophers elect to live in bone-dry ground. It is true that they often make short excursions into it, but in almost all cases the main runways are in soil with some indications of subsurface moisture. During the old days before the advent of the white man into the ranges of many of the lowland gophers in California, conditions entirely propitious for the presence of these animals occurred in somewhat restricted, and often scattered, areas, as small stretches of grass along the upper washes, or around the border of a cienaga. These spots were frequently separated from each other, sometimes by considerable distances, and at other times by little rocky ridges only a few yards across. If the animals traveled only underground, they then would frequently be confined to the immediate vicinity of their birthplaces, and inbreeding would soon occur, with consequent deterioration of stock and even extermination in small areas, which could not subsequently be restocked. Hence, the ability and incentive for overland traveling is of considerable importance to many members of the genus.

Very few pocket gophers have been taken in surface traps, probably for the reason that the ordinary mouse trap is too weak to hold such an animal. The present writer uses a home-made, wooden-base trap of the usual pattern, but the spring has almost twice the pull of the ordinary, factory-made product, and the part that secures the animal measures two and a quarter inches each way. These obtain greater results, for I have taken three small gophers in them, baited with oats, and with no burrows nearby. Even this trap is, of course, entirely inadequate for large or medium-sized animals.

The same contention obtains for moles: the ordinary mouse trap is out of the question, and even my larger ones can hold the smallest animals only when the trap can kill them instantly by smashing the skull. After the following manner I have caught three individuals of the coast mole (*Scapanus orarius orarius*) in oat-baited traps.

A specimen June 23, 1919, near Hardy, Mendocino County, California, in a trap set beneath a log, which latter was several inches above the ground for a distance of three feet. There was no sign of an open burrow within eighteen inches of the trap in either direction.

A specimen September 9, 1920, at Pleasant Valley, near Tillamook, Oregon, in a trap set at the edge of a blackberry thicket. Consequently, the ground could be examined for only a foot or more from the trap, but no burrow was found.

A specimen September 17, 1920, at Netarts, Tilamook County, Oregon, in a trap set in a dense thicket of salal (*Gaultheria shallon*) on a hillside. There was much trash on the ground, which I carefully removed for three feet in all directions, but could find no burrow.

As mentioned, these three animals were killed instantly by deep fractures of the skull. One can but speculate on the number of moles which blundered into the traps and, because of not being paralyzed at once, easily pulled free.

Pasadena, California.

CHLAMYTHERIUM SEPTENTRIONALIS, A FOSSIL EDENTATE NEW TO THE FAUNA OF TEXAS

By Alvin R. Cahn

[*Plates 2–3*]

The discovery by Leidy[1] of the large edentate *Chlamytherium septentrionalis* in Cenozoic deposits of Florida was, so far as the writer knows, the first find of this South American genus in the United States. Leidy described this animal under the name of *Glyptodon septentrionalis* sp. nov., from a number of dermal scutes. These, together with other scutes, were subsequently referred to *Chlamytherium humboldtii*, a South American species of the genus. Sellards[2] found more scutes and a right lower jaw in Pleistocene deposits of Florida, which showed that the North American animal was of a species distinct from the South American. Sellards, therefore, revives Leidy's specific name, but retains the generic name of *Chlamytherium*. Previous to the discovery of this jaw by Sellards, the only known remains of the animal in North America were a number of dermal scutes, and a portion of the movable

[1] Leidy, Proc. Acad. Nat. Sci., Phila., 1889, p. 97.

[2] Sellards, E. H., Chlamytherium septentrionalis, an Edentate from the Pleistocene of Florida. Am. Journ. Sci., Vol. XL, 1915, pp. 139–145.

CHLAMYTHERIUM SEPTENTRIONALIS

Upper fig.—Outer surface of jaw. Lower fig.—Inner surface of jaw. (Reduced.)

Fig. 1.—Dermal scute, outer surface.

Fig. 2.—Dermal scute, inner surface.

Fig. 3—Horizontal ramus of right jaw viewed from above. (Reduced.)

CHLAMYTHERIUM SEPTENTRIONALIS

band, all from Florida. A specimen from Texas, therefore, is of great interest, and extends the known range of this rare edentate considerably both to the north and west.

On March 6, 1921, the writer and two students visited the Brazos River at Pitts Bridge, about eight miles south and west of Bryan, Brazos County, Texas. At a point about a quarter of a mile below the bridge, on the Brazos County side of the river, one of the students, Mr. W. A. Rounds, found a right lower jaw of *Chlamytherium*, probably *septentrionalis*. For this identification the writer is indebted to Dr. W. D. Matthew and Dr. O. P. Hay. At the same time, but at a distance of over a quarter of a mile from the jaw, a single dermal scute was found, which may or may not belong to the same individual. A couple of months previous another scute, together with a piece of rib, had been found by Dr. Mark Francis, in the same place as was the scute found by the writer. This rib and scute were identified by Doctor Hay as belonging to *C. septentrionalis* several weeks before the discovery of the jaw.

The jaw has been very kindly donated by Mr. Rounds to the museum of the Texas Agricultural and Mechanical College, where it and the other specimens have been permanently placed.

It is somewhat uncertain from which formation this Texas jaw came. The Brazos River in this vicinity has cut a wide Eocene valley, which is largely filled with Quaternary and Pleistocene deposits, and these form abrupt, cliff-like banks to the stream. The jaw was found in a partially buried condition in a pile of sand which had recently slid off the face of the nearly perpendicular wall of the river bed, and was lodged at the top of the talus slope. It is evident that the dislodgment was recent, since a broken piece of the horizontal ramus was found close by in the sand. The deposit was presumably Pleistocene, but this can not at present be definitely stated. In addition to *Chlamytherium*, the following forms have been found in the vicinity of Pitts Bridge: *Equus complicatus*, *Elephas columbi*, *Elephas imperator*, *Mastodon americanum*, *Gomphotherium gratum*, *Camelops huerfanensis*, *Bison* sp?, *Megatherium* sp?, *Testudo crassiscutata*, etc.

The jaw under discussion, in spite of the fact that it has but two teeth in place, is in a considerably better state of preservation than the Florida specimen. Eight dental fossæ are complete; half of the ninth (the first incisor) fills the entire dental quota of one-half of the lower jaw. The ninth (molariform) tooth is present as a broken fragment, as in the Florida jaw; the seventh tooth is firmly in position and is complete.

With the exception of the missing teeth, two insignificant chips from the posterior margin, and the anterior margin of the mandibular symphysis, the jaw is complete. If we may rely upon the legend accompanying the figures in Sellard's paper (no measurements are given), the present jaw is somewhat larger than his specimen, since it measures 21.5 cm. from the middle of the broken first dental fossa in a straight line to the posterior margin of the jaw, and the height from the tip of the coronoid process to the lower margin of the mandible is 14.8 cm.

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JACKING IN EAST INDIAN JUNGLES

By Harry C. Raven

Shortly after my arrival in eastern Dutch Borneo I was introduced to the sport of "jacking," that is, hunting by night with a reflector lamp. At Samarinda I became acquainted with Mr. W. C. C. Olmeyer, whose father's deeds, by the way, furnished Joseph Conrad the plot for his novel "Almeyer's Folly." To shoot the shy sambur deer at night was one of Mr. Olmeyer's hobbies. I soon realized that this method of pursuit in the dead of night offered splendid opportunities to the naturalist. He who confines his activities to the day time faces a well nigh impossible task to gather first hand information about the habits of many animals, for in these tropical jungles few of them are seen by even the keenest observers. After dusk, however, the hunter, armed with a reflector lamp, can approach the shyest as well as the most dangerous of animals with little trouble. The glare of the light directed at their eyes renders him completely invisible to them.

One night Mr. Olmeyer had heard that a "musang," a species of viverrid, had been killing fowls in a neighbor's coop. He proposed that I join him in hunting the offender. At about eight o'clock we set out, my companion carrying his reflector lamp and armed with a shotgun. Before starting he showed me how brightly the eyes of animals appeared by flashing the light at the cats and dogs about the place. Their eyes glistened like balls of fire but could only be seen by those close behind the lamp, for the reflection from the eyes of an animal is straight back towards the source of light.

Within less than ten minutes we found the "musang" stealing noiselessly towards the chicken coop. Out of the forest, only a couple of hundred yards from the house, it stealthily passed along the ditch

bordering a banana patch. We kept very quiet, for the "musang" was coming slowly in our direction.

It stopped every few steps, and stared at the light, its eyes glowing like bright patches of yellow flame. Sometimes we lost sight of the chicken thief, but as we shifted the lamp from side to side the gleam of its eyes reappeared whenever it emerged from between the bananas or from behind the fence. Apparently undisturbed by our presence it came closer and closer and, at thirty feet, received the full charge of shot. I was greatly delighted to add to my collections such a fine specimen of *Paguma*.

Next morning, at the Chinese shops, I bought my own equipment for jacking; an imported Belgian wall lamp with a six-inch reflector, a round wick, and a cylindrical glass chimney eight inches long with the lower two inches slightly larger. The base in form of a truncate cone held oil for eight or nine hours' use. The only drawbacks to it as a hunting lamp were that the glass chimney would easily crack when drops of moisture fell upon it and that any strong wind would extinguish the flame. In spite of these deficiencies, my six and a half years' subsequent experiences in Borneo and Celebes, and one year in Africa, taught me that in open fields such a simple oil lamp is recommendable. But in the forests or in caves an acetylene lamp which can be tilted up or down is preferable, as is also the case on rivers where frequent splashes due to encounters with crocodiles may crack the chimney. In out of the way places, however, carbide is not so easily procured as is oil.

Having procured the above mentioned lamp for use in the jungle I sailed out of the Mahakkam River, and northward along the Bornean coast for about three hundred miles, in a small prahu with some Moros who, originally from the Philippines, were at that time living on a little island near the mouth of the Berau River. I intended buying a boat and hiring a crew of my own, when I reached the island for which we were bound, and had with me a Chinese boy whom I had brought as my cook. The trip to the island, the buying of the boat, and the gathering together of the men who were to accompany me were all very interesting, and I was soon ready to set out. Our first camp on the mainland of Borneo was at a place called Tandjong Batoe, a long, low point that is just north of the mouth of the Berau River. There the forest has to some extent been driven back from the shore for the natives have, for years past, been in the habit of making plantings of rice and cassava at the edge of the jungle. They burn the grass during the latter part of the south-east monsoon in August or September,

thus increasing the grassy area and, unintentionally, making a better feeding ground for the large sambur deer (*Cervus equinus*). The moon was waning and did not rise until about nine o'clock in the evening so until that hour the darkness was suitable for hunting. The natives had informed me that it was impossible to hunt on moonlight nights, and this statement was corroborated by my friend Olmeyer, who told me that when the moonlight was bright the animals were able to see the hunter and would clear off before he could approach within shooting range. However, my own experience did not bear this out for I found that the reflector lamp was a complete shield to the person behind it. Though he could easily distinguish the animal in the moonlight, the hunter was quite invisible providing he kept directly behind his lamp.

Half an hour after the sun had set the darkness was complete. The natives informed me that the "paiaw," as the sambur deer is called locally, did not come out of the forests before eight or nine oclock and it would be useless to start hunting before that time. Our camp was at the edge of the water at high tide so when all was ready we walked along the shore for a quarter of a mile or more, in order that we might be able to walk back through the open grass and cleared country to windward, for of course it would be hopeless to try to approach any animals if they were to leeward and could get scent of us. The coast at Tandjong Batoe is low and mostly level. When the leeward end of the grassy area had been reached we halted on the beach to light our reflector lamp. I decided that I preferred to carry the lamp and have the boys walk in a line behind me, with the one nearest to me carrying my rifle. It was agreed that if a deer was seen, all the other boys should stay behind and only the gun bearer follow close to me as we approached the deer; that when I decided the animal was close enough to shoot, I would give the lamp to the gun bearer and take the rifle from him.

As we started in from the shore we carefully wended our way through a mass of thorny bushes and tangled creepers and then came to a plain about a third of a mile wide by perhaps a mile and a half long, level for the most part and covered with long coarse grass known to the Malays as "alang alang." Here and there were scattered a few forest trees, usually with a mass of vines and bushes about their trunks, and also some isolated coconut trees which had been planted by the people who had originally cleared the point. There was not a sign of a trail and we wandered about through the thick grass that on the little knolls came up to our waists, and, in the hollows, reached above our heads.

We were crossing a large level part of the plain when, a little to one side and about three hundred yards ahead, I caught a glint of light; a few steps further, and I could distinctly see the reflection of four eyes. I held the lamp so that the boy carrying the rifle could see the tiny yellow balls of fire, just the color of a flame from an ordinary oil lamp. He said excitedly in a loud whisper "*paiaw dua, Tuan*" (two sambur, Mister), and then turning to the boys strung out behind him hurriedly whispered his information several times. At the same time I was telling them to be quiet lest the animals run away.

With the lamp held high, on or slightly above the level of my eyes, I began to go forward, at first very slowly and then, finding that I was more sure footed if going a little faster, I increased my speed. The deer seemed to be getting nervous and could be seen shifting their position, though as yet all that was visible was the reflection of the eyes. We were getting closer and the eyes appeared much brighter when I nearly spoiled our plans by stumbling into a muddy ditch about three feet deep. I managed to keep from dropping or breaking the lamp, however, and went on until, with a thrilling, whistling call, one of the deer turned and bounded away, but only for a few yards for it stopped and we could again see its brightly reflected eyes as it turned towards us. I approached until I could very faintly see the outline of the animal and immediately handed the lamp to the boy from whom I received my rifle. The boy stood to my left and the light from the lamp shone on the fore sight of the rifle. When the sound of the shot died away we could hear the stamping of only one deer as it bounded off into the darkness. The other was dead, the bullet having passed through the anterior part of its back almost at the base of its neck.

At Karang Tigau, another camp farther north along the coast, where I stayed for about a month at the mouth of a little river, I did a great deal of hunting at night. At this place or near it there were no native habitations, and for the month that we remained we saw no one. I had with me a Chinese boy and three sea-faring Malays, or Bajau, as they are called.

The forest at Karang Tigau was virgin and tropical and came right down to the edge of the water. At high tide the branches of some of the trees actually dipped their ends into the water which covered the sandy beach up to the line of drift. Most of my time during the first few days at this camp was occupied so fully in setting lines of traps and preparing specimens that the only hunting I did at night was to go

along the beach near the mouth of the river shortly after dark and shine the light on the water to detect fishes. Then one of my natives would throw a circular casting net and sometimes catch a bucket full of mullet-like fish at one throw.

Later on, however, I hunted nearly every night and the first time that I went out with the lamp and the gun I shot five mouse-deer within a few minutes, and within five hundred yards of camp. These little animals, which are chiefly nocturnal, are so protectively colored that during the day time they are extremely difficult to find, and, when disturbed, disappear from sight very quickly in the heavy forest which they inhabit. The natives usually hunt them with dogs. I have seen one of these animals, pursued by dogs, jump into a large river and immediately disappear beneath the surface, not coming up until it had gone about twenty yards. Then it continued, swimming on the surface until the other side of the river had been gained. On the beach at Karang Tigau where I hunted these little deer, they were usually to be found about eight or nine oclock in the evening lying down just inside the edge of the forest, and unless the wind was unfavorable or one made some unusual noise they would pay no attention to the light. I have often approached within from six to ten feet and stood watching them ruminating. Earlier in the evening, or just after dark, they would be found walking about in the forest and if there were any wild fig trees about with ripe fruit they would be almost sure to come to feed on the fruit which had fallen.

In going up the Berau River of northeastern Borneo, I found most of the country about the delta very low and much of it swamp, overgrown with nipa palms (*Nipa fruiticans*). With me on my large and clumsy sea-going prahu, were four Malays whose duty it was to row, paddle, and pole the boat. Tandjong Redeb is the principal and only real village on the river and is located about thirty-five miles from the sea. After going up-stream above Tandjong Redeb for one day's journey we passed a few clearings along the banks of the river and then for fifteen days we paddled and poled against the current of this great, beautiful, tropical stream walled in on either side by the finest of tropical forests which continued unbroken, for there was not a single native clearing, not even a hut along the banks. Behind the large prahu, we were towing a small and narrow dug-out canoe. Nearly every night on our journey up the river I took the gun and reflector lamp and hunted along the banks of the river, paddling for hours up the stream and then drifting down with the current, the whole time playing the rays of the

lamp about the banks, under the overhanging trees, between great logs and masses of roots, and up the mouths of little streamlets, even shining it high up into the great dark masses of foliage of the giants of the forest, and down into the muddy waters below.

As soon as I became accustomed to hunting at night, in order to get better results I told my natives that they must never speak while we were hunting; I sat cross legged in the bow of the canoe and, if I saw an animal, directed the rays of the lamp toward it and shook the canoe slightly as a signal to the men that they were to paddle in the direction which I thus indicated. They were not even to raise their paddles to the surface of the water lest the drip cause a sound, ever so slight, yet enough, in the stillness of the night, to arouse the suspicions or cause the flight of a wary animal.

Until this trip up the Berau River I had had no experience with crocodiles, though of course I had heard many very terrible stories about these animals from the natives and sometimes from whites as well. My first experience with a crocodile occurred one night while I was being paddled along close to the bank of the river. It was with the expectation of finding such animals as civets, jungle cats, mouse-deer, muntjac, sambur, and pigs that nightly excursions of this kind were undertaken. The canoe glided noiselessly along. Behind me were seated three Malays, one in the stern, one in the center of the canoe, and the third close behind me in the bow. The branches of the trees hung far out over the water and there were many partly submerged logs and snags. It was among these that I caught sight of the reflection from the eye of a crocodile. The reptile was headed up stream the way we were going. Holding the lamp high, I pointed with my finger at the animal hoping that the natives would see it, but they did not and as we were getting very close to it I picked up the shotgun (12 bore hammerless) which could be easily manipulated with one hand. The canoe was very flat, no part of it more than six or eight inches above the level of the water. When the bow of the canoe was within about ten or twelve feet of the head of the crocodile I fired. Only the upper part of the head with its eyes and nostrils was above the surface of the water. It seemed that simultaneously with the report of the gun there was a great splash and the next instant we were covered with spray, which broke the chimney of the lamp and nearly extinguished it. Evidently the coarse shot had glanced off the hard bones of the skull for the creature gave one great lunge and disappeared beneath the surface of the muddy water. We returned to the bigger boat and

secured a new lamp chimney and then continued our hunt for other animals. After several more experiences with crocodiles, my natives came to me and said that if I was going to continue to shoot crocodiles from a small canoe they wanted to leave my service, for they said that crocodiles had often overturned canoes and then eaten the occupants. When informed that I would be careful and that I did not intend to shoot any more crocodiles at such close range they were satisfied for the time being.

Some of the natives were very enthusiastic about hunting at night and were always delighted when they learned that I was going; others seemed to think that it was a useless sort of thing to do as the animals usually obtained were of no use to them for food, though the Dyaks as a rule would eat almost any kind of meat. On one occasion I found a group of proboscis monkeys (*Nasalis larvatus*) sleeping in the trees that overhung the river, and by getting nearly under them and playing the light on them from below for a few moments and then turning it aside for a few seconds so confused the monkeys that when we made a noise below by shouting and clapping the paddles on the water they jumped about from branch to branch. Two fell from their high perches. One caught on some lower branches and the other came down into the water and, as it was a large one was shot as it climbed out on the branches protruding from the bank.

Early in 1914 I made a trip up the Mahakkam River. It was possible to have my houseboat-like prahu of a sea-going type towed up the river as far as Long Iram by a small steamer. At Long Iram the Dutch Official, Captain Muller, very generously helped me to procure Dyaks as paddlers and loaned me a long canoe in which to travel to a Dyak village known as Long Hurei. At this place, where I found Bahau Dyaks, I sent the long canoe back to Long Iram and secured from the Bahau three smaller canoes and some of their people to take me up Long Merah, a river confluent with the Mahakkam above Long Hurei and coming in from the northward. After two days of paddling against the current and poling up rapids, the Bahau brought me to a temporary dwelling place of some Punans or nomadic Dyaks. I wished to camp among the Punans for a time, so the morning after our arrival my Bahau friends departed and I told them that when I wanted them to return for me I would send one of the Punans down to bring them word.

For a few days I camped with the Punans and then moved about half a mile down stream and made camp on the opposite bank of the river. While encamped here in the absolutely virgin forest where the

sunlight filtered through the dense foliage in slender beams of light, I shot and trapped by day and hunted with the light at night either by following the little trails made through the forest or, as proved to be more profitable, by paddling and poling on the river seated in the bow of the narrow canoe. The Punans would either squat behind me to paddle or stand to pole and maneuver the canoe where there were rapids, or where fallen trees had blocked part of the passage. I remember very distinctly that on one occasion we were quietly drifting down stream and not a word had been spoken since we left camp. The Punans stood up and took the poles and I knew we were approaching rapids. The banks of the river were rather high at this particular spot and the tall trees in some places formed an arch over the river. Long lianas hung down from branches high over the river and the roots trailed and swayed in the swiftly flowing stream. The canoe started down the rapids, guided skillfully between the rocks and away from the breakers, which, although only a few inches in height, would have been sufficient to swamp it. I continually played the rays of light from the lamp along the banks and over the river. As we were nearing the lower end of the rapids I caught the reflection of the eye of an animal ahead and to my left. The canoe was gliding swiftly, so holding the light with my left hand I grabbed my shot gun with my right, raised and fired it quickly just as the canoe was swept down the last of the rapids and came out on a sleek quiet pool where the river was somewhat wider. I then spoke to the Punans telling them that I had shot some kind of a cat for the eye had appeared bright and white. They were much surprised for they had seen nothing. They spun the canoe around and when it came along side the bank I carefully replaced my gun in the bow, after having reloaded it, and climbed out on the roots which overhung the bank. The Punans seemed surprised that I put my gun down and asked if I were not going to take it, to which I replied with calm assurance that I could tell by the reflection of the eyes that the animal was only a cat. I clambered over a mass of roots, vines, clay, rocks and dead leaves to the top of the bank fifteen or twenty feet above the river and then just as I put my hand over the broad flat buttress-like root of a large tree I touched a warm and furry body and saw before me the animal I had shot, *Felis neubulosa*, the clouded leopard, the largest of the Felidæ to be found in Borneo. It is one of the most beautiful members of the cat family, with a pattern of grays and black, somber yet handsome.

One of my Punan friends who accompanied me was a sturdy young chap named Lekio who owned a very fine "mandau," a short sword with a blade which is flat or hollow, ground on one side and rounded on the other side. His sword, which he had gotten from a Kenyah in exchange for two dogs, he prized very highly and would not sell for anything that I had to give him. However, when I shot the clouded leopard, he and all the other Punans were greatly surprised for these animals are rare. Lekio immediately began to beg for the canines of my prize, but I explained to him that I could not take out the canines without spoiling the skull for my purpose. Nevertheless he continued to beg for the teeth until he got so excited that his whole sturdy muscular body was covered with perspiration and he went away telling me and his companions that I was absolutely without pity, for he believed that the teeth which he wanted would protect him from the head-hunters of other tribes. To find out how much he valued the teeth I asked him if he would give me his "mandau" in exchange for them. He immediately brought his weapon to me but I told him I valued the perfect skull more than his "mandau" and could not exchange with him.

I was surprised to find that the reflection of the eyes of nearly all nocturnal animals could easily be seen with the light and that the different species showed considerable variation. The eyes of most insects, such as moths and butterflies, reflect a pink or reddish light, as do spiders, crawfishes, and fishes. The deer, muntjac and *Tragulus* reflect an even yellow light like the flame of an oil lamp. The wild pigs reflect a pinkish light that is rather weak and always looks small. The banteng (*Bos sondaicus*) gives a bright reflection, very pale yellowish or greenish in color, sometimes almost white.

The size of an animal may be judged by the distance between its eyes. If by chance, as sometimes happened, several deer were before the light at one time it was possible to pick out the buck because of the greater width of the head and consequently the greater distance between the eyes. The color of the reflection from the eyes, the size, the distance apart, and the height above the ground frequently furnished evidence enough so that it was possible to tell what kind of animal was being approached. Of course at first, night hawks sitting on low branches or logs would be mistaken for deer or sometimes for a civet, but it was soon learned that mammals invariably move about and do not keep the head in one position for more than a few seconds, as do the birds and reptiles.

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NOTES ON THE MAMMALS OF NORTHERN LAKE COUNTY, MINNESOTA

By Charles Eugene Johnson

Lake County, Minnesota, lies well within the Canadian life zone. Its northern two-thirds, approximately, is in the Hudson's Bay drainage basin. The portion with which the following notes are concerned is included in what is known as the Superior National Forest and is a large forest-covered area the surface of which is somewhat hilly and rough but abundantly supplied with lakes and streams. The principal forest trees are spruce, jack-pine, balsam fir, cedar, a certain amount of Norway pine and white pine, and birch and poplar. Dense growths of alder fringe many of the streams but here and there the water courses are bordered by strips of marsh land of varying widths; and bogs and swamps are of frequent occurrence. Altogether there is a considerable variety of habitat so that the region is in many respects ideal as a wild life preserve. It is uninhabited and conditions are essentially undisturbed by man except in one or two portions where the timber had been removed a good many years ago, or more recently as indicated subsequently. Since the area was made a forest and game preserve some ten or more years ago the wild life within it has enjoyed full protection, but previous to that time it had been extensively trapped. Very recently a limited number of reliable trappers have been licensed by the State Game Commissioner to enter the territory to trap wolves and also a number of other carnivorous fur-bearers which were believed to be sufficiently plentiful to warrant a certain amount of trapping.

The following list, with the exceptions therein stated, contains the mammalian species observed and taken by me personally in the course of a number of summers devoted principally to motion-picture photography of Minnesota big game, under the patronage of Mr. James F. Bell of Minneapolis. This work was carried on during the seasons of 1912 to 1915 inclusive and the specimens taken within this period are in the collections of the Zoological Museum, University of Minnesota. In the latter part of last summer (1920) I returned to this region for a brief survey of the territory covered in the previous years and some of the changes that had taken place are remarked upon later in this paper. For some of the smaller mammals listed the present records are too meager to establish either their relative abundance or their distribution within the area in question. It is my hope, however, if opportunity offers, to add to these notes in the future.

FIG. 1. OUTLINE MAP OF NORTHERN LAKE COUNTY, MINNESOTA, SHOWING PRINCIPAL LOCALITIES MENTIONED IN THE TEXT

The accompanying outline map is included for the purpose merely of indicating the principal localities mentioned in the text.

Specimens of *Tamias*, *Eutamias*, *Peromyscus*, *Evotomys*, *Microtus*, *Synaptomys*, and *Mustela cicognanii* have been examined and identified as listed, by the U. S. Biological Survey. In regard to the beaver of this region, it is possible that it is to be assigned to the rather recently described subspecies *michiganensis* of Bailey, but this awaits verification by actual comparison.

Odocoileus virginianus borealis. Northern White-tailed Deer.—Common. A total of 132 deer was seen, among which were 38 bucks, 63 does, 12 fawns and 19 which could not be identified as to sex. More deer were always seen in the closer-in localities than in the more remote parts where the timber wolf no doubt was largely responsible for their smaller numbers as well as their greater wariness. Along the water courses of this region are numerous little grassy bays which are much sought as feeding grounds by the deer. A number of times deer were met with on islands, in both lakes and rivers, some of them no more than an acre or two in size, and none more than fifty or seventy-five yards distant from the mainland. The animals probably had become accustomed to a sense of security on these islands and sought them for resting places, for they had but little attractiveness as feeding grounds. Specimens from N. and S. Kawishiwi districts; L. Isabella.

Alces americanus. Moose.—When I first entered this region, in 1912, moose were very common in the North and the South Kawishiwi River district, and eastward and southeastward as far as our observations extended, namely to the Perent River. Also during the three seasons that followed moose were plentiful and distinctly appeared to be increasing. In 1915 alone, during a period of about nine weeks, 132 moose were seen and trails and wallows were abundant about the water courses. I did not visit the region again until the summer of 1920, when, to my surprise and disappointment I met with a total of only 5 moose from July 26 to September 4. Signs seemed to indicate that the bulk of the moose population had deserted the territory. Many of their favorite feeding grounds of former years bore no signs of having been frequented by moose this season It is my belief that this disappearance of the moose was the result chiefly of disturbances due to logging operations that had been carried on in the intervening period, along the North and South Forks of the Kawishiwi and along the main stream further eastward. If this be true then one may hope for a gradual return of the moose with the restoration of normal quiet. Specimens from Clear L.; S. Kawishiwi; L. Bald Eagle.

Rangifer caribou caribou. Woodland Caribou.—I have personally no positive evidence of the presence of caribou in the part of Lake County covered by these notes. However, at Saw Bill Lake in Cook County, about six or eight miles from the eastern border of Lake County, it was reported to me by Mr. Leslie Brownell, then forest supervisor, that a number of caribou had been seen in the winter of 1917. Mr. R. G. Schreck, present acting supervisor, reports that a number of caribou are still found in that same general region.

According to Mr. John Schafer, municipal judge of Ely, caribou were common along the Kawishiwi River in Lake County, twenty years ago, being found as far westward as Farm Lake. He mounted several heads from specimens killed in Twp. 63, R. 10, in this county. Logging then began and the animals left the district.

Glaucomys sabrinus sabrinus. Northern Flying Squirrel.—August 23, 1913, a male was trapped on the ground at the foot of a cedar, at the lower end of the first rapids of the Isabella River above Lake Bald Eagle. September 4 a female was taken on a fallen log about 30 rods distant from this place. These were the only specimens secured, but the species is probably of regular occurrence in suitable localities throughout the region.

Sciurus hudsonicus hudsonicus. Red Squirrel.—Of general occurrence in this territory but in no locality visited did the species seem to be plentiful. The squirrels were most in evidence in localities where cedars occurred. On the seeds of these trees the animals always seemed to feed abundantly and the ground in such places was often literally covered with cedar cones. The species as a rule was found very quiet in this region, rarely indulging in its scolding chatter. Specimens taken on the North Kawishiwi—Clear Lake portage; at the outlet of Lake Bald Eagle; at the Isabella River rapids at Bald Eagle; and at Rice Lake.

Tamias striatus griseus. Gray Chipmunk.—Common in suitable localities throughout the region. Specimens taken on the North Kawishiwi—Clear Lake portage; on the South Kawishiwi in the Clear Lake region; at the Isabella River rapids at Bald Eagle.

Eutamias borealis neglectus. Long-tailed Chipmunk.—Found in all the localities in which the preceding species occurred, and apparently was more numerous; it was certainly more in evidence. Several of each species usually congregated about our camp wherever we remained for any length of time. At one point where a trail crew had left a peck of oats in a box, a half dozen or more of each kind often feasted together in reasonable harmony while it lasted, but the smaller species seemed to have some fear of the larger. Specimens from the same localities as for *Tamias*.

Marmota monax canadensis. Canada Woodchuck.—While apparently of general distribution it was nowhere found to be very common. A specimen was taken June 19, on the north shore of Clear Lake; it apparently had its den in a crevice among some rocks. A half-grown specimen in the black phase was taken along the South Kawishiwi, July 24. Other localities where records were obtained are: north shore of Gabro Lake, specimen shot July 31; Isabella River rapids at Bald Eagle, one seen August 15; northeast shore of Lake Isabella, specimen shot by Prof. N. L. Huff, August 28. The first three records are for 1912, the last two for 1913 and 1914 respectively.

Castor canadensis. Beaver.—In 1912 no recent signs of beavers were found along the route followed from the North Kawishiwi southeastward, until we reached the Little Isabella River, although careful scrutiny was made along all the water courses between these two points. Along the Little Isabella, however, many fresh workings were located, evidently of animals that had come down from the headwaters of this stream where a colony was known to have existed a year or two before. The following season a new lodge was discovered down stream on the Isabella River, about a mile above Bald Eagle, and in 1914 and 1915 very notable extensions of operations were observed along the Isabella from this point eastward nearly to Perent Lake; while a single lodge had been built at "Dead Man's Rapids" on the North Kawishiwi. When I returned to this territory in 1920 it was apparent immediately that a great spread of the beaver had taken place during the intervening period. More than a score of lodges were located beyond those recorded in 1915 and as time did not permit our covering all of the localities examined in that season there is no doubt that many more might have been found. In addition to lodges there were of course many new operations such as dams and cuttings, and numerous beavers were seen. Several lodges of the former years were still occupied and had grown to much larger dimensions. On August 2 a young beaver about the size of a full-grown muskrat

was surprised and caught in the hand near one of the recently built lodges. Specimens from L. Isabella; L. Bald Eagle; Isabella River.

Peromyscus maniculatus gracilis. Deer Mouse.—Abundant in all parts of the territory. This species was taken in a variety of situations such as the exposed floor of deep woods, in open grassy places, on fallen logs and under logs, and one specimen was taken on the limb of a cedar about four feet from the ground. Two stomachs that were opened contained green vegetable matter, seeds, the remains of some insect larvæ and shields and other skeletal parts of insects.

Evotomys gapperi loringi. Red-backed Vole.—It is a question in my mind whether this or the preceding species should be given first place in point of numbers. Both were found a nuisance because of the frequency with which they got into the traps and interfered with the catching of more desirable species. The red-backed vole was taken in broad grassy meadows bordering water courses, on exposed rock outcrops, in boggy places within the deeper woods, on logs and under logs and over the forest floor generally. June 25 a female was taken which contained 8 embryos in early stages of development; another pregnant female was taken August 4.

Microtus pennsylvanicus pennsylvanicus. Meadow Mouse.—This mouse was not found to be very common but may be more plentiful than the results of the trapping would seem to indicate. Specimens were taken in the following localities: North Kawishiwi end of the Clear Lake portage; on an old logging road where it crosses the South Kawishiwi west of Clear Lake; along Snake Creek near L. Bald Eagle; on the second portage of the Isabella above Bald Eagle.

Ondatra zibethica zibethica. Muskrat.—Common along the streams. The muskrat rarely builds its characteristic "houses" in this region, the animals living usually in bank burrows, and in some localities apparently among rock crevices at the edge of the water. July 23 five young about one-third grown were taken at a "house" on the North Kawishiwi a short distance above "Dead Man's Rapids;" and on the same day in a nearby locality a female was taken which contained 7 fetuses about the size of the common house mouse. The muskrats in this locality had been cutting down some young shoots of poplar, about the size of a lead pencil in thickness, from which the leaves had been stripped and eaten, as was shown by the stomach contents. I employed such shoots and also those of dwarf maple successfully as bait in trapping the muskrat in this and other localities.

Synaptomys fatuus. Bog-lemming.—A single specimen of this species, a male, was taken among some dense, small shrubbery at the edge of the water, at the North Kawishiwi end of the Clear Lake portage, July 1, 1912. Continued trapping in the same locality failed to obtain more, nor were specimens secured elsewhere; but trapping on a larger scale would no doubt prove the species to be of regular occurrence in this region.

Zapus hudsonius hudsonius. Jumping Mouse.—Probably occurs throughout the region, in suitable localities. July 25, 1915, a jumping mouse was seen on a dry grassy knoll near the south bank of the Isabella River opposite Rice Lake. In August, 1920, a specimen was taken in a dry grassy spot at the first portage landing above Rice Lake.

Erethizon dorsatum dorsatum. Canada Porcupine.—Fairly common. The majority of the porcupines seen were met with while they were feeding at the edge of some lake or stream. In a number of instances they were observed eating the rhizomes of water-lilies that had been pulled up by the moose. The porcupines were at times seen to secure this food, and no doubt also other kinds found in such places, by reaching down into the water full length of the arm, feeling about until some object was encountered and then hauling it in with the hand. Half grown specimens still accompanied by the mother were several times met with.

Lepus americanus phæonotus. Minnesota Varying Hare.—Found throughout the region but it was much more common in the underbrush along the North Kawishiwi and in the Clear Lake district than further out, as for example in the Isabella Lake region. This is very likely due to the greater number of enemies preying upon the species in the more remote localities.

Lynx canadensis canadensis. Canada Lynx.—I was informed by Fred Mayo, one of the trappers in this territory, that only once during the trapping season of 1919–20 did he come upon tracks of the lynx; he considered the species rare, having failed to secure a specimen during his trapping experience in this range. I was informed by Mr. John Schaefer that lynx are still occasionally brought in from other parts of Lake County.

Lynx rufus rufus. Wild Cat.—The only evidence I have personally obtained of the presence of the wild cat in this particular part of the county is the record among my notes of an old skull picked up in 1912 near the junction of the Island River with the Isabella. Neither of the two trappers had taken or seen any specimens of the wild cat in their operations of 1919, but Mr. R. G. Schreck informs me that the species is quite certainly present although scarce.

Vulpes fulva. Red Fox.—The red fox occurs in all parts of this territory, apparently in moderate numbers only. One of the trappers considered it fairly common in the Kawishiwi River and Gabro Lake districts; the other held it to be rather scarce in the Isabella River and Lake region. My own evidence is limited to three foxes seen, two of which were taken; one of the specimens was a black phase. The localities are: The South Kawishiwi about a mile below Clear Lake; the hill bordering the bay of the S. Kawishiwi southwest of the Gabro Lake portage (black specimen); Isabella River about half a mile below L. Isabella.

Canis nubilus. Timber Wolf.—Found in all parts of this territory but more especially in the remoter districts. Signs of the timber wolf were frequently met with from the Gabro Lake region eastward and southeastward as far as my observations extended. In September, 1912, I chanced upon one of these beasts while it was feeding upon a dead moose at the rapids of the Isabella River at Lake Bald Eagle; and in August, 1920, I shot an immature male along this same river at Rice Lake (Johnson, Journ. of Mammalogy, Feb., 1921). One of the trappers reported having seen a number of packs of wolves in this region in the winter of 1919–20. Each of the men had taken about half a dozen of the animals in their trapping operations that season. The total destruction of big game by the timber wolf in this entire region is unquestionably quite considerable.

Lutra canadensis canadensis. Otter.—The first signs of otters in the territory covered were seen in 1914, along the Isabella River at the first portage above Rice Lake. Here was found a recently inhabited den and also other evidence

of the presence of otters during that season. The animals themselves, however, were not seen and no attempt was made to trap for them. August 16, 1920, a female accompanied by two young was seen in the Isabella River about a mile below Isabella Lake; and on August 22, an adult accompanied by one young was seen in a beaver pond on a small stream entering Isabella Lake on the northeast shore. With continuation of the protection that the otter has enjoyed in the region for a number of years past, the species may be expected to show a steady increase.

Mephitis hudsonica. Northern Plains Skunk.—My only record is for a female specimen taken at the mouth of a small stream entering the North Kawishiwi from the north, just above "Dead Man's Rapids," June 26, 1912.

Mustela vison vison. Mink.—More or less common in all parts of this region. In addition to a number of minks seen at various times in other parts of the territory, specimens were taken in the following localities: West shore of Lake Bald Eagle; the junction of Snake Creek with the Isabella; the upper end of the rapids of the Isabella at Bald Eagle; north shore of Lake Isabella.

Mustela cicognanii cicognanii. Common Weasel.—A female of this species was taken by one of my companions, Mr. R. C. Chapman, along the Isabella River about half a mile above Bald Eagle, August 20, 1912; in August, 1920, I saw two of these weasels at the rapids above the locality mentioned. Trapper Mayo reported the species as occurring in moderate numbers during the trapping season.

Martes americana americana. Marten.—Mr. R. G. Schreck reports the marten as present but very scarce in other portions of northern Lake County but in the part visited by me I have no evidence of its occurrence; the two trappers mentioned stated that they had not secured any specimens of this species.

Martes pennanti pennanti. Fisher.—The trappers reported that each had taken a number of fishers during the winter of 1919–20, and considered the species generally distributed throughout the greater part of this territory.

Ursus americanus americanus. Black Bear.—Fairly common and, I believe, increasing. In addition to many signs found in various parts of the region visited, bears were seen in the following localities: 1912, northwest shore of Gabro Lake; 1913, rapids of the Isabella at Bald Eagle; 1914, North Kawishiwi River about a mile east of Farm Lake, and the northwest shore of L. Isabella (specimen); 1915, Isabella River just below Pike Falls; 1920, Island River at the first long rapids above its mouth.

Sorex personatus personatus. Common Shrew.—A specimen was taken August 24, 1914, on a point of land covered with birch, poplar, spruce and balsam fir, on the east shore of Lake Isabella. The presence of the shrew was suspected in many other localities but the traps employed were rather ill adapted to the capture of these tiny mammals and this probably accounts largely for the meagerness of the catch. The species is undoubtedly of general occurrence in all this region.

Sorex richardsonii. Black-backed Shrew.—A single specimen was taken in 1915, in a bog on the northwest shore of Clear Lake. The species is probably of general occurrence.

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TWO NEW SKUNKS OF THE GENUS CONEPATUS

By E. A. Goldman

Skunks of the genus *Conepatus* are as a rule far less numerous than are those of the genera *Mephitis* and *Spilogale* which over a wide area, embracing most of Mexico and sections of the southwestern United States, may occur at the same localities. Study of slowly accumulated material assignable to this unrevised genus has resulted in the discovery of two hitherto unrecognized geographic races which are described below.

Conepatus mesoleucus venaticus subsp. nov.

ARIZONA HOG-NOSED SKUNK

Type from Blue River (Cosper Ranch), 12 miles south of Blue, Arizona (altitude 5000 feet). No. 205376, ♂ old adult, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, September 1, 1914. Original number 22459.

Distribution.—Southeastern Arizona and adjacent parts of New Mexico, Sonora and Chihuahua, mainly in Upper and Lower Sonoran Zones.

General characters.—A rather small form most closely allied to *C. m. mearnsi;* general size and color similar; skull decidedly narrower and differing in detail.

Color (type).—Top of head, upper surface of neck, back, and tail above and below, white, the tail with a thin admixture of dark hairs along median portion; face, sides of neck, flanks, fore and hind legs and underparts black as usual in the group.

Skull.—Closely resembling that of *C. m. mearnsi*, but narrower throughout; braincase smaller, less expanded; zygomata less widely spreading; interorbital region more constricted; interpterygoid fossa narrower; nasals narrower; audital bullæ variable, but usually slightly smaller, less inflated; sagittal crest in adult males very prominent; dentition about as in *mearnsi* (less heavy than in *C. m. mesoleucus*).

Measurements (type).—Total length, 630; tail vertebræ, 230; hind foot, 76. An adult female topotype, 585, 255, 70. Average and extremes of 2 adult males from Graham Mountains, Arizona, 640 (640–640); 255 (250–260); 73.5 (73–74). *Skull* (type).—Greatest length, 72.9 (median line); condylobasal length, 70.2; zygomatic breadth, 49.4; interorbital breadth, 18.6; width of braincase at constriction behind zygomata, 37.4; mastoidal breadth, 42.7; median width of interpterygoid fossa, 6.6; front of canine to back of large upper molar, 22.4; length of upper incisor series at cingula, 11.

Remarks.—Specimens from Diamond Creek and head of Mimbres River, New Mexico, assigned to *C. m. mearnsi* are very variable and indicate intergradation with *C. m. venaticus*. From its geographic neighbor on the south, *C. sonoriensis*, the Arizona form differs markedly in the smaller size of the skull, with relatively longer, narrower nasals and narrower interpterygoid space. The extension of white of upper parts is variable as usual in the species. It usually

forms a broad mantle reaching in some specimens well down along flanks. In some individuals there is a white spot on the throat, and the ears may be whitish.

Specimens examined.—Total number, 22, from the following localities:

ARIZONA: Blue River (type locality), 5; Ash Creek, Graham Mountains, 2; Black River, 1; Fort Huahuaca, 1; Fort Lowell, 1;* Fort Whipple (near Prescott), 1; La Osa, 1; McMillenville, 1; Nantan Plateau, 1; Raspberry Creek, Prieto Plateau, 1; Tucson, 1.

NEW MEXICO: Animas Valley, 1; Dry Creek, 1.

CHIHUAHUA: Colonia Garcia, 2.

SONORA: Santa Cruz, 1; San Jose Mountains, 1.

Conepatus mesoleucus nelsoni subsp. nov.

NELSON'S HOG-NOSED SKUNK

Type from Armeria (near Manzanillo), Colima, Mexico (altitude 200 feet). No. $\frac{33252}{45257}$, ♂ old adult, U. S. National Museum (Biological Survey Collection), collected by E. W. Nelson, March 3, 1892. Original number 2004.

Distribution.—Region of the type locality in Colima and probably adjacent parts of western Mexico, Arid Tropical Zone.

General characters.—Similar to *C. m. mesoleucus;* general size and color about the same; skull narrower, less massive and differing in detail.

Color.—About as in typical *C. m. mesoleucus*, the white dorsal area somewhat variable as in that form. In the type and in a specimen from Hacienda Magdalena, Colima, the white extends entirely across the back near the middle, while in an example from Colima, Colima, the white area is considerably reduced in width.

Skull.—Compared with that of *C. m. mesoleucus* the skull in both sexes is narrower, less massive, with smaller less inflated braincase, and less widely spreading zygomata; interorbital region narrower; sagittal and lambdoid crests in type (old male) high and trenchant; frontal region depressed and dentition rather heavy, much as in *mesoleucus*.

Measurements (type).—Total length, 664; tail vertebræ, 287; hind foot, 88. Average and extremes of 2 adult females from Hacienda Magdalena and Colima, Colima, 593 (602–585); 251 (265–237); 75 (74–76). Skull (type): Greatest length (median line), 78.2; condylobasal length, 74.8; zygomatic breadth, 52; width of braincase at constriction behind zygomata, 39.5; mastoidal breadth, 45.7; median width of interpterygoid fossa, 9; front of canine to back of large upper molar, 25; length of upper incisor series at cingula, 11.5.

Remarks.—Conepatus mesoleucus nelsoni is a western tropical form of the species which is typical on the high plateau region of Mexico. The skull differs markedly from those of *C. leuconotus* of tropical eastern Mexico, and *C. sonoriensis* in lesser elongation, and depressed instead of highly arched frontal region.

Specimens examined.—Three, all from the state of Colima, Mexico as follows: Armeria (type locality), 1; Colima, 1; Hacienda Magdalena, 1.

Biological Survey, Washington, D. C.

*Collection of A. B. Howell.

NOTES ON THE MAMMAL FAUNA OF TSUSHIMA AND IKI ISLANDS, JAPAN

By Nagamichi Kuroda, Rigakushi, M. A. S. M.

The principal papers on the mammals of Tsushima were published by Mr. O. Thomas (Ann. & Mag. N. H., (6), XIX, p. 161, 1897; P. Z. S., p. 182, 1905; op. cit., pp. 47–54, 1908). Mr. N. Teraoka and I obtained 10 species and subspecies of mammals on that island during the last year. I have been able to add 2 species to those hitherto known from it, bringing the total number of forms to 14.

On Iki Island Mr. Thomas writes that "After Tsushima Mr. Anderson visited the Iki and Goto Islands, the resulting collections proving that those groups are absolutely similar to S. W. Japan in their mammal fauna" (P. Z. S., 1908, p. 49). Mr. H. Orii collected mammals on Iki Island and Mr. Teraoka and I also visited the island and brought back a small number (3 species) of mammals.

All the known mammal fauna of Tsushima and Iki Islands are listed and noted below.

The * mark indicates the new additions to the mammal list of both islands.

FAM. TALPIDÆ

1. **Urotrichus talpoides adversus** Thomas.—Anderson obtained this form on Tsushima (Thomas, P. Z. S., 1908, p. 49).

2. **Mogera wogura kanai** Thomas.—A specimen was presented by Mr. S. Fukagawa. It was obtained at Izugahara, Tsushima, date unknown. Mr. Teraoka collected a specimen at Nukadake-mura, Tsushima, October 27. Skulls from the above specimens are both broken. The coloration of body in Tsushima specimens varies from very pale (greyish brown or even golden color) to deep reddish brown. Holst obtained a specimen on Tsushima (Thomas, P. Z. S., 1908, p. 49).

FAM. SORICIDÆ

3. **Crocidura coreæ** Thomas.—Anderson collected it on Tsushima (Thomas, P. Z. S., 1908, p. 51). This is one of the Korean forms.

FAM. RHINOLOPHIDÆ

4. **Rhinolophus cornutus cornutus** Temminck.—Mr. Fukagawa presented to me an albino specimen of this form. It was obtained near Izugahara, Tsushima, date unknown. Mr. Teraoka collected a female on Wakamiyajima, Iki Island, November 2. Holst obtained it on Tsushima (Thomas, P. Z. S., 1908, p. 49).

*5. **Rhinolophus ferrum-equinum nippon** Temminck.—An albino specimen was presented to me by Mr. Fukagawa. It was obtained near Izugahara, Tsushima. It is probably a new addition to the mammal fauna of Tsushima.

FAM. VESPERTILIONIDÆ

*6. **Myotis tsuensis** sp. nov. Diagnosis.—General color of upper and lower parts reddish brown chestnut, somewhat lighter on the lower parts.

The type specimen was collected near Izugahara, Tsushima, date unknown, and was presented to me by Mr. Fukagawa.

Measurements, in millimeters

HEAD AND BODY	TAIL	HEAD	EAR	TRAGUS	FOREARM	THUMB	3RD FINGER	4TH FINGER	5TH FINGER	TIBIA	CALCANEUM	FOOT AND CLAW	TAIL FREE FROM MEMBRANE	TOTAL LENGTH OF SKULL	BASILAR LENGTH OF SKULL	ZYGOMATIC BREADTH OF SKULL	PRESERVED IN:
[1]61	51.5	18.5	17	8.5	50	11.5	75	64.5	63.5	23	26	12	2.5	18	16	11	N. Kuroda's coll.
70	47	19.5	16	9	50	10	80	66.5	67	25	25	12	2.0	—	—	—	Tsushima elementary school coll.

[1] The type specimen.

The new species is probably a resident on Tsushima. It differs from *M. macrodactylus* (Temm.) from Hondo and Kiusiu by much larger body and by the color of fur. Another species is found in Kiusiu called by the name of *M. nattereric bambinus* Thos., but it has shorter forearm, 40 mm., and the calcaneum extending about halfway between the ankle and the tail, instead of extending at least three-fourths the distance between the ankle and the tail.

*7. **Miniopterus schreibersi japoniæ** Thomas.—An adult male was collected by Mr. Teraoka on Wakamiyajima, Iki, November 2. There is no difference between this specimen and specimens from Hondo, Japan.

FAM. MURIDÆ

8. **Apodemus geisha sagax** Thomas.—Mr. Teraoka obtained two specimens at Sasuna-mura, Tsushima, October 15 and at Komoda, Tsushima, October 25. Thomas reported it from the island (P. Z. S., 1908, p. 54).

9. **Apodemus speciosus speciosus** (Temminck).—Mr. Orii and Anderson obtained the specimens on Tsushima (Thomas, P. Z. S., 1908, p. 53). Mr. Orii obtained it on Iki Island.

10. **Micromys minutus aokii** subsp. nov. *Micromys minutus* (Pallas), subsp., Aoki, "Nihon san Nezumika," p. 41 (1915).

Diagnosis.—Length of head and body shorter than the length of tail; under parts of body pure white, hairs without any slate color at base; upper parts uniform russet brown; lower rump, base of tail as well as side of body rufous color; border of upper and lower parts very well defined; ear covered with russet hairs; hand and foot covered with very pale yellowish hairs; tail long and uniform pale yellowish-brown with short hairs; number of tubercles 5 on fore foot and 6 on hind foot.

The type and an adult female specimen with 5 embryos, were obtained by Mr. Y. Utano near Izugahara, Tsushima, October 29, 1920, and were sent to me by him.

Measurements, in millimeters

LOC.	HEAD AND BODY	TAIL	HIND FOOT	EAR	TOTAL LENGTH OF SKULL	BASILAR LENGTH OF SKULL	ZYGOMATIC BREADTH OF SKULL	SEX	MEASURED BY:
*Near Izugahara, Tsushima	—	75	14.5	8.5	18	15.5	10	♀	N. Kuroda
**Tsutsu-mura, Tsushima...	—	74	15.7	8.3	—	—	—	♀	Mr. Aoki
**Tsutsu-mura, Tsushima...	55	67	14	7	18.5	15.6	9.5	♀	Mr. Aoki
***Izugahara, Tsushima.....	54	53	14.5	9	—	—	—	♂	Mr. Thomas

* Type. Measured on the moistened skin, ** measured on the specimens in alcohol and *** probably measured on the fresh skin.

Mr. Aoki ("Nihon san Nezumika"=Muridæ of Japan, pp. 41–45, 1915) described the new form but did not give it a name and he compared 7 other forms of *Micromys minutus*. The new form differs from *M. m. soricinus*, *M. m. pratensis*, *M. m. ussuricus*, *M. m. japonicus* and probably *M. m. minutus*, by the tail longer than head and body, except the specimen measured by Mr. Thomas which is almost in the same length (P. Z. S., 1908, p. 54). It differs from *M. m. pygmæus*, by the under parts pure white instead of earthy color. It is probably most related with *M. m. flavus*, but it differs from the last form by the upper parts russet brown instead of bright yellow.

The subspecific name is given in honor of Mr. B. Aoki.

11. **Rattus norvegicus** (Erxleben).—Mr. Thomas (P. Z. S., 1908, p. 53) reported it from Tsushima. Mr. Orii sent me his observation on the rat on Tsushima as follows:—This rat is found near fresh water and sea shore in great numbers. Its holes were seen in sides of banks and grassy places among rocks. At the ebb-tide, it enters into sea water and captures shells as well as small fishes, etc. It also eats vegetable matter in the fields.

FAM. FELIDÆ

12. **Felis microtis** Milne-Edwards.—One specimen and two skins were presented to me by Messrs. Fukagawa, K. Nakayama and U. Kishihara. I have compared the specimens with one Korean example and found that there is no appreciable difference between them, except the markings are less distinct in the Tsushima specimens. Not common now on Tsushima. Mr. Thomas reported it from this island (P. Z. S., 1908, p. 52).

FAM. MUSTELIDÆ

13. **Mustela itatsi** Temminck.—A young specimen was obtained by Mr. Teraoka on Iki Island, October 31. Mr. Orii collected specimens on the same island.

14. **Mustela sibirica** Pallas.—A young specimen was presented to me by Mr. C. Kato. It was obtained at Niimura, Tsushima, October 23. Mr. Thomas (P. Z. S., 1908, p. 53) reported it from Tsushima.

15. **Martes melampus tsuensis** (Thomas).—Mr. Fukagawa presented to me a summer skin of this interesting animal. It was obtained at Mine-mura, Tsushima, May, 1919. The head of the specimen is wholly black. Mr. Thomas (Ann. & Mag. N. H. (6), xix, p. 161, 1897; P. Z. S., 1908, p. 52) reported it from Tsushima.

16. **Cervus (Sika) nippon nippon** Temminck.—A head with antlers was presented to me by Mr. C. Kato. It was obtained at Niimura, Tsushima, spring of 1919. Another pair of antlers sent me by Mr. N. Yamashita. It was obtained at Tsutsu-mura, Tsushima. Mr. U. Ichimura sent me a skin which was obtained at Tatsurasan, Tsushima. Mr. Thomas (P. Z. S., 1908, p. 54) reported it from the same islands.

The following species are said to have occurred on Tsushima and Iki Islands:

? **Mus molossinus** Temminck.—Mr. Orii informed me that he obtained 3 specimens on Iki Island. They probably belong to this species. Orii's measurements are as follows:

♂ H. & B. 65 mm., tail 59 mm., hind foot 15.5 mm., ear 11.5 mm.
♂ H. & B. 59 mm., tail 55 mm., hind foot 15.0 mm., ear 12.0 mm.
♀ H. & B. 55 mm., tail 52 mm., hind foot 14.5 mm., ear 12.0 mm.

Nyctereutes sp.—Formerly abundant on Iki Island. But at present, it is said that it is almost an extinct species.

Lutra lutra (L.), subsp.—It is said that this animal is found in Tsushima and Iki Islands.

Sus sp.—Formerly abundant (about two hundred years ago) on Tsushima, but now become wholly extinct.

Fukuyoshi Cho, Akasaka, Tokyo, Japan.

ON A NEW BAT FROM MANCHURIA

By Arthur de Carle Sowerby, F. Z. S.

In the autumn of 1914, while on a collecting trip in the forests of North Kirin, Manchuria, on behalf of the United States National Museum, I secured a specimen of a *Murina* representing a form related to *M. huttoni* of northern India, but sufficiently distinct from the latter as well as from all other known forms from eastern Asia to warrant its being separated as a new subspecies of *huttoni*. The specimen was sent to the United States National Museum, where, in company with Mr. Gerrit S. Miller, Jr., of that institution, who passed on his notes to me, I was able to reexamine it. This new form may be known by the name:

Murina huttoni fuscus subsp. nov.

It may be described as a dusky brown form of *huttoni* in which there are numerous long hairs of a lighter color scattered through the pelt and extending on to the webbing between the tail and the hind legs as well as upon the feet. The under parts are slightly lighter than the upper parts.

It differs from true *huttoni* in being of a darker color, *huttoni* having been described as "light snuff-brown" by Hutton in 1872. There is, however, no detailed description of true *huttoni*. Peters described the upper incisors of this species as being separated from the canines as in *suilla*, of Java and Sumatra, his plate of the latter showing a wide and definite space quite unlike the narrow crack in the Kirin specimen.

The Kirin specimen differs from *M. ussuriensis*, Ognev, of the Ussuri region, in its larger size, its forearm measuring 40 mm. instead of 32 mm. It differs from *M. hilgendorfi*, Peters, of Japan, in being larger, its head and body measuring 58 mm. as against 50 mm. There is no sign of the low sagittal crest present in *hilgendorfi*. From *M. auratus*, M.-Edw., of Tibet, it differs in its much greater size; from *M. leucogaster*, M.-Edw. (with which it agrees in general size) in its very different color, *leucogaster* having the entire upper parts "brun-châtain," and in the much less backwardly-projecting occipital region; from *M. sibiricus* in having the upper incisors proportioned as in *leucogaster;* and from *M. rubella*, Thos., in the absence of any red color.

It may be mentioned, incidentally, that *M. ussuriensis* and *M. hilgendorfi* have been secured in Manchuria, while *M. rubella* was described from Kuatun, in Fukien province, China.

Type.—Female, skin and skull, No. 199672, U. S. National Museum, taken in the forest of North Kirin, Imienpo area, Manchuria, September 28, 1914, by A. de C. Sowerby. Original number, 702.

Measurements.—Head and body, 58 mm.; tail, 34 mm.; ear, 18 mm.; forearm, 40 mm. Skull.—Greatest length, 16.8 mm.; zygomatic width, 10.4 mm.; upper tooth row, exclusive of incisors, 5.6 mm.; lower tooth row, 6.4 mm.; lower jaw, 12.2 mm.

Color.—General greyish, or dusky brown, with no sign of reddish. Slightly lighter below, darker round the eyes.

The distribution of this new form is not at present known. Its presence in the Imienpo district so late in September, and the fact that the specimen described above was secured in the house of a Russian peasant, suggest that the species hibernates in this region.

Shanghai, China.

DISPOSITION AND INTELLIGENCE OF THE ORANG-UTAN

By W. Henry Sheak

It is difficult to say which of the two great apes, the chimpanzee or the orang-utan, is the larger. I have spent many years studying living specimens in captivity and the mounted skins and skeletons in museums, but I am not yet convinced in favor of either. It is probable, however, that the chimpanzee will average slightly taller than his Bornean cousin, but there is scarcely any doubt but what the orang will average considerably the heavier of the two. He is much more robust in his build.

I have talked with a number of men who have hunted these two anthropoids, and I have read all the literature available, with a result similar to that from my own personal observations. Doctor Hornaday's largest male of the species *Pongo wurmbii* (if *wurmbii* be a distinct species) measured 4 ft., 6 in. in height. A male of *P. satyrus* measured 4 ft., 4½ in., so that there is very little difference in size between these two. His largest female measured 4 ft. in height. Joseph S. Edwards, the well known exhibitor of rare animals, who has had extensive experience with the orang as well as with the chimpanzee, and who imported the first gorilla that ever reached the United States alive, tells me that his brother once sailed from Singapore with seventeen orangs and two of them were 5 ft. in height. According to Wallace, the stretch of arms of the largest orangs is 7 ft., 8 in. However it has been verbally stated to me that "Chief Utan," the great orang that lived in the Philadelphia zoölogical garden a few years ago and whose well-mounted skin now adorns the mammal hall in the Academy of Natural Sciences of Philadelphia, measured 8 ft., 4 in. from tip of fingers to tip of fingers over the outstretched arms. But I have not had the opportunity of verifying these figures. The weights of the largest adults range from 120 to 160 pounds.

In many of the anatomical characters, the orang-utan does not so much resemble man as does his African relatives of the genus *Pan*. He differs from the chimpanzee in twenty-three characters. In twenty of these the chimpanzee is more like man than the orang, while in but three is the orang more like man than the chimpanzee. These three characters are:

1st. The number of pairs of ribs and number of dorsal vertebræ, there being twelve in the orang, as in man, while in the chimpanzee and gorilla there are thirteen.

2nd. The absence of superciliary crests—prominent bony ridges protruding out over the eyes, which so disfigure the face of the gorilla and are well marked in the chimpanzee.

3rd. The form of the cerebral hemispheres. In the orang they are much more like those of man, than are those of the chimpanzee. The orang has a straight full forehead, while the forehead of the chimpanzee is considerably receding.

In disposition the orang-utan is much quieter and less obtrusive than the chimpanzee. Doctor Hornaday tells me that while he was in their native forests and jungles, he never saw one on the ground, unless he had been wounded or driven down by man. Even when thirsty he does not come to the ground to drink, but climbs out on the limb of a tree overhanging a stream or pool, until his weight bends the branch down so that he may reach the water. In captivity this great ape is much inclined to sit in a corner of his cage, motionless and voiceless. But when captured young he takes fairly well to captivity, becomes friendly and attached to those who feed and care for him, and seems to enjoy human society.

About fifteen years ago I was traveling with the Gus Lambrigger Animal Show as naturalist and lecturer. At the time of which I speak, we had a young orang which had come to us only about three weeks earlier. One afternoon, having finished a lecture, I sat down in a chair with my back to the stage or platform on which the small portable cages were arranged. I was some little distance from the orang's cage. But presently I felt two long hairy arms encircle my neck and a strawberry-blond youngster climbed down into my lap and proceeded to make himself very much at home. He had himself opened his cage door and walked along the stage in front of the other cages until he could climb over on my back.

I have seen the orangs in the New York Zoölogical Park follow their keeper about on the lawn, and when he would attempt to run away from

them, they would hurry after him, using their long arms as a man would use a pair of crutches, but often putting their heads to the ground and turning a somersault in their efforts to overtake their human friend. I have also seen them sit at table and use knife, fork, and spoon in eating, and drink out of an opaque bottle, looking repeatedly down the neck to see how much of the delectable fluid might be left.

A two-year old baby orang which the Edwards Brothers had on exhibition in New York City in 1908, was very timid and much afraid of our large chimpanzee. The chimpanzee liked to tease the little fellow, because she saw he was afraid of her. When she would stamp her foot and threaten him, he would run to me and throw his arms about my neck, plainly imploring my protection from the great black, ugly beast, which he doubtless thought her to be.

Though the orang may sit quietly in a corner of his cage, his beautiful brown eyes see everything about him. Indeed I have found him a very keen observer. One day I was standing in front of the cage of the orang with the Lambrigger Zoo, already referred to, when he came over near me, put his arm out between the bars, and went to examining something on my shoulder. On investigation I found there was a tiny knot, not larger than the head of a small pin, in the thread of the seam in my coat. I had not noticed it previously, but his eyes had caught it from the back of the cage and he was trying to get it.

The orang-utan does not laugh aloud as often as the chimpanzee, but he has a smile that is strikingly human-like. When two young orangs are kept together, they become quite playful, romp and chase each other about, but in a more sedate and deliberate way, and not with the frantic haste and daring so characteristic of the chimpanzee. When thus engaged at play there is often a pronounced and joyous smile on their beaming faces. Now and then there may be a low chuckle, but not often.

As already noted, they often become much attached to their keeper. They are also devoted to their own kind, and will often fight for each other, and especially their young. They will sometimes make pets of other animals, as cats, dogs, and rabbits. I once knew an orang that became much attached to a young pig-tail monkey. They spent much time together, the pig-tail usually sleeping in the ape's arms. The orang was very affectionate, often fondling and caressing his little pet, and showing great patience, for the pig-tail was quarrelsome and vindictive, and often resented the familiarity of his fond foster father.

While the orang-utan is quiet and unobtrusive, and not as good an animal for exhibition purposes as the chimpanzee, I believe him to be almost, if not altogether, as intelligent. He is not always inventing countless new ways of amusing himself and working off a superabundant store of physical and mental energy, as does his African cousin, but when it comes to solving problems to satisfy his own needs or desires, and to doing things that are really worthwhile, he manifests wonderful intellectual power.

A few years ago the Edwards Brothers owned a large orang-utan which they called Joe. He was remarkably intelligent and learned the meaning of about seventy words and expressions. He knew all the coins from the silver dollar down to the copper cent, and would invariably pick out the one asked for. One day the janitor made a mistake in filling a lamp, using gasoline instead of coal oil. When lighted, the lamp, which was directly in front of Joe's cage, took fire all over and exploded, burning Joe severely. After that he was always afraid of a lamp. If he wanted anything, he gave a peculiar call, and then when one of the proprietors or one of his keepers came to the cage, he gave him a push to send him off in the direction of the object desired. One night he had thus called up Solomon Edwards, father of the two Edwards brothers. He kept sending Mr. Edwards off to the back of the room, but nothing the old gentleman brought seemed to satisfy him. Now it chanced there was a lantern, belonging to the watchman, which was hanging in the back of the room, invisible to Mr. Edwards, but where Joe could see it from his cage, and this lantern having been turned too high, was blazing up and smoking. When Mr. Edwards discovered it and turned down the wick, the orang was satisfied. It was plain that he recognized the flame was blazing too high and that he feared another explosion.

On another occasion Joe exhibited what is, to my mind, one of the keenest and most complicated mental processes ever displayed by an animal. On the day in question, there chanced to be an English walnut lying near the cage, but just beyond his reach. He made several ineffectual attempts to secure it by stretching out his long arms. Then he tried to twist some of the straw on the floor of his cage into a rope or wand, but the straw was too brittle and too much broken. It is no uncommon thing for the apes, and even some of the lower monkeys, and especially the spider monkeys, to twist straw into a rope or wand to serve some of their needs. At length the orang began to take off his "sweater," a knit woolen jacket which he was wearing. We wondered

why he was doing this, as he was not in the habit of taking off his clothes without permission. With the slow and deliberate movements so characteristic of this ape, he carefully removed the garment, poked it through the bars of the cage, swung it out till it dropped over the walnut, rolled the nut to within reach, secured it with his hand, then after he had cracked the shell with his teeth and eaten the kernel, he just as deliberately and carefully put the sweater on again.

Joe did not like to take medicine. Mr. Joseph Edwards tried to give him some pills by putting them into the tip end of a banana. But he discovered them in his mouth and picked them out. He looked at the pills, and then he looked at Mr. Edwards, with an expression of reproach and incredulity upon his face, as if he could not believe that his loving master could serve him such a scurvy trick. For a considerable time after that, whenever he was given a banana, he broke off the tip and threw it away or gave it to one of the little monkeys. In his final sickness he was treated by a skilled physician. It was necessary to give him an injection. On the third visit he amazed the man of medicine by getting ready for the treatment just as soon as he saw the syringe. The doctor declared that this was more than he could expect from his human patients.

I have seen the white-handed gibbon (*Hylobates lar*) run and deliberately walk, on the posterior limbs, and as perfectly upright as man. This without any teaching. But aside from the gibbons, the apes rarely do this. When on the ground they swing themselves along by putting down the knuckles and using the long arms as a pair of crutches. However, a big male orang-utan that died in the Philadelphia zoölogical garden in the fall of 1918, was in the habit of doing so. On several occasions I saw him walk about his cage, without using his arms, either on the floor or by holding to a support, and as perfectly erect as a man. Keeper McCrossen declared he had not been taught. This is very difficult for the orang to do, on account of the very imperfect sigmoid flexure of the spinal column.

Philadelphia, Pa.

GENERAL NOTES

A ROVING BAND OF SAY'S BATS

On the 12th day of July, 1912, my little daughter came to say that there were a lot of strange animals in the roof of our porch. I found they were bats, a whole row of them, thirty-two in number, in a long opening under the eaves, heads out, apparently looking at us. All seemed to be the same size, and yet two, which fell down, could scarcely fly. I had to help them up again to the place. These two were undoubtedly *Myotis subulatus*, the long antitragus being very well marked, and I am satisfied that all the rest were of this species. The one I handled uttered a peculiar *"chik, chik, chik,"* while I held it. All dodged back out of sight when I went too close. On the floor below were a number of pellets. These I gathered up and sent to the Biological Survey for examination. That night the bats were very busy around the porch. Next morning all were gone and have never been there since. I have not the slightest reason to suppose that they ever were there before. I do not know of any bat colony in the neighborhood. It seems to me that this incident points to a hitherto unsuspected habit of roaming in bands during the summertime.

The pellets according to report of the Biological Survey "contained the remains of numerous Diptera, several spiders, a scarabæoid beetle and one cuckoo-fly (Hymenoptera) *Chrysis* sp."—ERNEST THOMPSON SETON, *Greenwich, Conn.*

THE BROWN BAT ACTIVE IN WINTER AT WASHINGTON, D. C.

One of our more severe winter days in Washington, D. C., was February 5, 1917. The temperature at noon was 10°F., the atmosphere clear, but the wind high, blustering, and penetrating. At 1:25 p.m. I noticed a brown bat (*Eptesicus fuscus fuscus*) flying past a window at the west end of the new National Museum. It alighted on a narrow ledge in a cornice, 9 feet above ground, on the north wall of the extreme west wing (freight entrance) of the museum. Here it was exposed to the full blast of the cold wind from which it was apparently suffering intensely. It would remain still a moment, hunched up with the wing membrane protecting its side. Then it would run along the ledge 2 or 3 feet and rest again. These actions continued for about 8 minutes, when it flew to the ground and alighted on a cement sidewalk about 20 feet from its former resting place on the wall. A few minutes later I rescued it from the pavement. It was now in a semi-dormant condition, showed none of its bat-like pugnacity, and evidently would have died soon from exposure. I brought it into the museum where the warmth almost instantly revived it. Released, it flew about the office for about 5 minutes, frequently testing the wall for a favorable place to alight. It finally settled at the edge of the ceiling where it hung by its pollical claw from a crack between the ceiling and wall.

While the bat was flying about the room, its form, outlined against the white walls, tempted me to count the wing beats. I was surprised that, in several counts, they averaged 280 per minute.—HARTLEY H. T. JACKSON, *U. S. Biological Survey, Washington, D. C.*

THE GRIZZLY BEAR AS A TREE-CLIMBER

We are all, of course, familiar with the ever recurring statement that the full grown grizzly does not climb, and William T. Hornaday in his American Natural History claims that this species, in contrast to the agile black bear, cannot climb trees.

At the present time there is confined in the Philadelphia Zoological Gardens, a fully matured grizzly (*Ursus horribilis*) which, whenever occasion arises, both climbs and descends the tree in the center of his den with far greater speed and ease than any black bear ever exhibited, and I have personally observed other grizzlies confined in the same dens demonstrate similar climbing ability.

Is it not, therefore, reasonable to suppose that grizzlies have the ability to climb, but that their habits of life are such that, under normal conditions, climbing would never be a useful trait to develop?—ARTHUR H. FISHER, *Washington, D. C.*

WOLVERENE IN ITASCA COUNTY, MINNESOTA

In a recent paper on the mammals of Itasca County, Minnesota, there appears no record of the wolverene (*Gulo luscus*) for the region. (Cahn, A. R., Journ. Mamm., vol. 2, pp. 68–74, May, 1921.) Through the kindness of Dr. H. V. Ogden, of Milwaukee, Wisconsin, there has been for several years an almost perfect skull of an adult male wolverene from Minnesota in the possession of the Biological Survey. The animal was killed in section 7, T 61 N, R 25 W, Itasca County, January 11, 1899. The specimen is number 110,281, United States National Museum, Biological Survey Collection.—HARTLEY H. T. JACKSON, *U. S. Biological Survey, Washington, D. C.*

MORE ACROBATIC SKUNKS

During 1912 I published in *Country Life* an account of my skunk farm. A paragraph was devoted to the skunk "Johnny Jumpup" who had the curious trick of standing on his front feet with hind feet up in the air. Commenting on this in a letter, Mr. J. S. Duss, Jr., of New Smyrna, Florida, wrote to me at the time that "civet cats" were quite numerous around his house on the peninsula opposite the town. They were very tame and it was almost the rule for them to do the "very stunt which Johnny does." He had seen "several at one time about the back porch doing the act."—ERNEST THOMPSON SETON, *Greenwich, Conn.*

RED SQUIRRELS SWIMMING A LAKE

On September 18, 1921, I visited White Sand Lake, Vilas County, Wisconsin, on a fishing trip. While my companion and I were arranging for a boat he noticed a small animal swimming some distance out from the shore and asked what it was. I ventured the opinion it might be a muskrat, but the boatman said no, it was a red squirrel, and that they had been crossing the lake to this (the south) shore from a point on the north shore for some days past. Sometimes as many as four or five were seen to cross in one day, according to his statement. I was somewhat incredulous as I had never seen a squirrel take voluntarily to the water. His assertion in this case was soon verified, however, for the little animal came almost directly toward us and landed scarcely twenty feet from where we were standing. It didn't hesitate a moment as it reached the land but quickly crossed

the narrow beach and plunged into the underbrush. Its landing apparently excited the interest or curiosity of another squirrel, which came chattering down a nearby tree. It would have been easy to interpret the incident as the cordial greeting of a relative who had made the passage earlier and was anxiously awaiting the arrival of the recent immigrant.

The point from which the squirrel came is a long, heavily wooded promontory extending from the north shore, and separated from the south shore by perhaps an eighth of a mile of open water. At other places the lake is the better part of a mile in width. No reason for the migration—for the transit of the lake seemed to be in one direction only—was evident, though the boatman suggested that "something must be after 'em over there." Perhaps a more plausible explanation is that there was a scarcity of food on the point (or a superabundance of squirrels, which would amount to the same thing) which was driving them to seek new territory and the heavy forests of the south shore were more attractive than the somewhat more scanty growth to the northward.

The individual we saw swam calmly and evenly with head well up, shoulders nearly submerged, but rump and tail high. It gave the appearance of swimming without exertion, and did not seem at all fatigued when it reached the land. It may be a common habit for squirrels to cross bodies of water in this way, as it is with many other land mammals, but if so, it has escaped my notice.

Since writing the above note I have learned from a colleague, Prof. William H. Wright, that on August 15, 1921, he caught a "pickerel" (great northern pike, *Lucius lucius*) 37 inches in length and weighing a little over 11 pounds, which contained in its stomach a full grown red squirrel. The squirrel was intact, having apparently been devoured quite recently. The fish was caught in Lake Fanny Hoe, Keweenaw County, Michigan, at about 7 p.m. This is a deep lake some two miles long and one-fourth to one-half mile wide, and is completely surrounded by forests. The residents of the region expressed no surprise as they said the squirrels frequently swim the lake.—Leon J. Cole, *Madison, Wis.*

GRAY SQUIRREL IN THE ADIRONDACKS

In 1887 I was shooting on the south branch of the Beaver River in the Adirondacks. At that time red squirrels were very numerous, but one day, on the edge of a burning among some bushes, I saw a gray squirrel which I shot. It was an adult male and besides being castrated had only the stump of a tail and showed many scars, the result I suppose of attacks by red squirrels. As this was the only gray squirrel I ever saw in that part of the country, and I was there in 1887, 1888, 1889, and 1890, I write to ask if there are other records of them. My guides had never seen others there.—George L. Harrison, *Poplar House, St. Davids', Pennsylvania.*

EARLY RECORDS OF BUFFALO IN "CALIFORNIA" [= NEVADA, UTAH AND SOUTHWESTERN WYOMING]

Several early writers mention the buffalo as a native of California. Thus Lansford W. Hastings, in an account of an overland trip to Oregon and California in 1842, enumerates the game found in what was then the western part of California—the California of today—and states that the game in the *eastern section*—now Nevada, Utah, and western Wyoming—was with very few exceptions

practically the same. He goes on to say: "In addition, however, to the game found in that [*western*] section, the white bear [= grizzly], the mountain sheep and the buffalo, are also found, in this [*eastern*] section. The latter of which, are here found in much greater numbers, than in any other portion of the country, west of the Rocky Mountains. In many portions of the country, the plains and hills are literally covered with them. Several tribes of the Indians here, as in Oregon, subsist almost entirely upon the beef of the buffalo, which they are enabled to obtain, in any desired quantities."[1]

This reference to buffalo and grizzly bears in California requires explanation. At the period in question (1843) California was a Mexican province extending easterly from the Pacific Coast to the Rocky Mountains. Hastings states specifically that Green River "is to California what the Columbia is to Oregon, the Mississippi to the United States" and so on (p. 72). He states also: "The Colorado and its tributaries water much of the northern portion; most of the southern, and all the eastern portion of Upper California" (p. 75); and furthermore that Great Salt Lake is "situated entirely in California" (p. 76). This accounts for the mention of buffalo in connection with grizzly bears and mountain sheep in California.

Chittenden's Map of the "Trans-Mississippi Territory"[2] during the period of the Fur Trade from 1807 to 1843 places the northeastern boundary of the Mexican Possessions far enough east to include not only the Green River country but also the Medicine Bow Mountains of Wyoming.—C. HART MERRIAM, *Washington, D. C.*

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[1] Lansford W. Hastings, The Emigrants' Guide to Oregon and California, p. 99, 1845.

[2] Hiram Martin Chittenden, The American Fur Trade of the Far West, Vol. 3, 1902.

RECENT LITERATURE

Cabot, William Brooks. LABRADOR. Boston; Small, Maynard & Co. 8 vo., xiii + 354 pp., illustr., 1921.

A land of great spaces, of windswept hills and strong rivers, of uncounted lakes and uncharted coasts, Labrador is today the only remaining wilderness in eastern North America. That it has been so little visited is due in part to its forbidding aspect, the difficulty of transport, the almost unbelievable multitudes of mosquitoes, conditions which combine to repel the casual traveler. For these very reasons it continues to be the home of a tribe of splendid Indians, the Naskapi, who live their primitive hunter life little touched by the all-destroying white man.

The author tells of a series of summer excursions mainly into the more northern portion along the east coast of the peninsula, partly with a view to geographical work, largely, however, for the study of these same Indians into whose favor he has patiently won his way.

Though chiefly concerned with other things, the book contains many valuable notes on mammals. In especial, the chapter devoted to "Mice" should become a classic to stand with Darwin's bumblebees. The species is apparently the Labrador meadow mouse (*Microtus enixus*). "Like the rabbit it increases in numbers through a term of years and suddenly disappears. . . . . In 1903, my first year in the country, mice were not noticeably plenty. Caribou had been abundant through the winter, by early July passing north in large numbers close to the coast. There were some falcons about, the splendid light-colored gyrfalcons, besides rough-legged hawks, dark and almost equally fierce. Both kinds breed in cliffs about the islands. I saw few ptarmigan. . . . . Foxes, the most important fur game, were fairly plenty. By 1904 mice were distinctly abundant. Hawks were more numerous, the white ones shrilling from many cliffs as we approached their nests. It was that year, I think, perhaps the next, that foxes were noted by the shore people as being scattered and shy; they would not take bait. . . . . Ptarmigan were fairly numerous. The wolverene we shot was full of mice. There were no caribou to speak of. We saw a good many wolf tracks, chiefly along the river banks, where mice are apt to be, but heard no wolves at night. . . . . The next year, 1905, was the culminating year of the mice. Sometimes two at a time could be seen in the daylight. Low twigs and all small growth were riddled by them. There was a tattered aspect about the moss and ground in many places not quite pleasant to see. . . . . Falcons had increased visibly. . . . . Owls were not many, but had increased somewhat; we saw only one snowy owl. All trout of more than half a pound had mice inside. Ptarmigan were very plenty, and the wolves—we may have seen the tracks of two hundred—were silent still. The bear of the trip was full of mice. . . . . Caribou were still scarce even on George River, and foxes plenty. In the spring of 1906 the mice disappeared with the snow. . . . . With the vanishing of the mice the change in the visible life of the country was remarkable. The falcon cliffs were deserted, coast and inland. . . . . We felt the absence of their superb flights and cries. In the trout reaches of the Assiwaban fish were numerous, but they were living on flies now, with what minnows they could get, and were no longer mousey but sweet and good. No owls appeared;

there had, however, never been very many. Our bear of the year was living on berries. . . . . Ptarmigan were all but wanting, old birds and young. It is fair to suppose that in previous years they were let alone by their natural enemies in the presence of the superabundant mouse supply, and were enabled to increase to their unusual number in 1905. . . . . For the first time we heard the wolves nights, a far, high-pitched howl—their hunting cry. I suppose it is for the ears of the caribou. Uneasy, they move, a track is left for the wolf to find and sooner or later the chase is on. . . . . Once the wolves found themselves upon the hard times of early 1906 they may have sought the caribou and started them to move. They certainly did move, as the twelve or fifteen hundred carcasses [killed by the Indians for winter use] at Mistinipi that year went to show.

"The bearing of the mouse situation on the human interests of the region is easy to see. It affected all the game, food game and fur. The abundance of mice tended to build up the ptarmigan, which are of vital importance in the winter living of the Indians through the whole forested area to the Gulf. Likewise it built up the caribou herd by providing easier game than they for the wolves. The departure of the mice did the reverse, reducing the deer and ptarmigan, but it may have brought the deer migration as suggested. . . . . Nor were the shore people by any means untouched. All their land game came and went, was plenty or wanting, shy or easily taken, according to the supply of mice. London and St. Petersburg, easily, were affected through their great fur trade." These and other relations in the interdependence of animals are forcefully suggested.

Under the heading "Creature Colorations" are gathered a number of keen observations as to the adaptive significance of the color pattern of certain northern species, including the wolverene, the arctic and varying hares, weasels and ptarmigan. These and numerous other items told in passing constitute all together a valuable contribution to the natural history of the North.

The book itself is attractive to the eye and hand; its story of travel, hardship, and discovery is well and simply told, intimate yet restrained. The spirit of out-doors runs through it all; one comes regretfully to the last page.

—*Glover M. Allen.*

Thorburn, Archibald. British Mammals. Longmans, Green, and Co., London. 4 to, Vol. 1, pp. i–viii, 1–84; col. pl. 1–25, line cuts in text, 8. 1920. Vol. 2, pp. i–vii, pp. 1–108; col. pl. 26–50, line cuts in text, 8. 1921.

The purpose of this splendid work as set forth in the preface "has been to provide pictures in colour of all those animals classed as mammals which inhabit or visit our islands." The author includes in this scope the Cetacea, twenty forms in number, making the treatment very comprehensive.

To quote again from the preface: "Planned as a companion to the volumes on 'British Birds' and 'A Naturalist's Sketch Book,' recently published, it gives a series of reproductions from water-colour drawings of the seventy species which make up the list, and in addition to these are shown various subspecies or closely allied forms, among others some of the local races of mice which have attracted the attention of naturalists during recent years." "A short description of the animals represented has been included, giving the general distribution, colour, measurements, and some notes on the habits of the various species, ..."

The two volumes comprise a de luxe edition of beautiful and artistic colour plates with accompanying text, the treatment being designed more for the layman than for the systematic worker. Scientific names are given for all of the groups, from the order to the subspecies, although the trinomial is seldom employed, while the common name is given the emphasis. The characters of each species, brought out in the text, are generally few and of such a nature as to be most readily discerned by the layman.

The first volume takes up the Chiroptera and deals with twelve species, all of which are figured in the coloured plates. The greater horse-shoe bat is given some four pages of text, which serve as a preparation for the treatment of the order, but most of the other species are given less space. Accounts of habits, food and distribution make up the bulk of the text.

The order Insectivora includes only five species, the hedgehog, mole, and three species of shrews. All five are portrayed in colour with a text treatment similar to that given to the bats. Fifteen species are taken up in the Carnivora, beginning with the wild cat and fox, including the walrus and six species of seals and concluding with the Mustelidæ, the otter, badger, pine martin, polecat, stoat and weasel. Fourteen plates are given to this order and among these plates are some of the most effective of the two volumes. The text treatment seldom runs up to three pages, even the fox being allotted only a scant two and a half pages, while some of the seals are dismissed with a page.

The first volume closes with two species of the Rodentia, the common squirrel and the common dormouse, each being given a plate. In the second volume this order is completed, with a total of nineteen species and in addition to the two plates of rodents in the first volume, eleven more are devoted to the order in this volume. Incidentally the author uses the blanket name *Mus* to cover nine of the small rodents, taking under this genus the harvest mouse, wood mouse, common mouse and brown rat. The text accompaniment varies from three and a half pages for the harvest mouse and the common hare to a scant page for the Orkney vole. The Ruminantia, with four species claim five plates and twenty pages of text.

The second volume takes up the last order, the Cetacea, with twenty-one species, nine plates and forty-six pages of text. The treatment of the order begins with four pages of remarks on the order in general, dealing with points of structure, measurements, food habits, classification, etc. The volume concludes with a few paragraphs upon mammals which have become extinct in the British Islands within historic times, the wolf, brown bear, beaver, reindeer and wild boar. An appendix gives additional data on the validity of the record of the occurrence of the walrus in the British mammalia. An index of four pages gives references under both scientific and common names.

The volumes are very well gotten up, the paper is very heavy and the type large, the plates are upon the highest quality stock and in the arrangement throughout the artistic influence of the author is readily apparent. The text is largely compilation from other authors with no attempt at the introduction of original matter, its sole function apparently being to serve as the medium for a satisfactory interpretation of the author's pleasing portrayals.

—*H. E. Anthony.*

Macewen, William, The Growth and Shedding of the Antler of the Deer. The Histological Phenomena and their Relation to the Growth of Bone. Glasgow: Maclehose, Jackson & Co., publishers to the University. Pp. i–xvii, 1–109, with 109 half-tone figures. 1920.

This beautifully illustrated volume is of as great value to the anatomist as to any one interested in deer. For the first time we have an anatomical treatise on the growth and shedding of the deciduous antler of the deer. This important investigation deals in detail with the histological changes which take place in the growing antler; it adds much to our understanding of the process of shedding of the antlers and explains their phenomenal growth.

Nowhere among animals do we find such an enormous and rapid reproduction of all the elements of the skin as in the growing velvet of the deer, which may cover the largest palmate antler within three months. The blood vessels in the velvet, which also form in a surprisingly short time, maintain the temperature of the growing bone within the hairy covering. These vessels anastomose but little with those of the underlying bone. The osseous growth of the antler is so rapid that the different phases of bone development may occur coincidentally. From the very beginning of antler formation there is going on a preparation for shedding. The latter is caused by the constricting of the blood vessels within the antler, particularly at the base, through the rapid proliferation of the bony tissue around them, which is followed by necrosis. Prior to the shedding, the bone on the distal end of the pedicle becomes softened, blood vessels within the pedicle increase in number and size, and granulation tissue is formed which loosens the connection between the dead antler and the pedicle. The shedding of the velvet, which precedes that of the antler, is likewise provided for in early stages of its growth. The bony substance emanating from the pedicle overlaps the latter, even in the sprouting antler, and forms the corona. The corona sends at first bony projections between the blood vessels of the velvet, which thus lie well protected in grooves. Gradually, however, these vessels are compressed and ultimately strangled by the advancement of ossification in the corona. The whole cutis then dries and peels off. The abundant multiplication of the bony cells in the growing antler, which are derived from the osteoblasts in the pedicle, can hardly be explained by normal cell division alone. The process known as nuclear budding may also partly account for this rapid production in ossification. During the growing period the antler is capable of repair after injury; at this time the pedicle is full of blood, which it transmits to the interior of the antler. After the termination of its development, the antler, no doubt, dies. The pedicle, however, must at all times be in active life, and preparing for the production of a new antler immediately after the shedding of the old one.

In addition to these normal conditions, the effect of injury to and disease of the pedicle and of castration on the growth of antlers is discussed in this much needed book.

—*A. H. Schultz.*

Krieg, H. Ueber die Bildung von Streifenzeichnungen bei Säugetieren. Anatom. Anz., vol. 54, pp. 33–40. 1921.

A preliminary report of investigations on the causes and origin of the stripe-distribution in the mammalian skin. Three principal types of arrangement are

distinguished: (1) Vertical stripes on the trunk, circular ones on the extremities, and stripes forming acute angles in the regions where those of the trunk and extremities meet and on the forehead and cheeks, e.g. Grèvy zebra. (2) Longitudinal stripes on the trunk, as in some young wild swine and in tapirs. This is a primitive type and is frequently found in combination with type 1. (3) Vertical stripes of the trunk extending to the extremities, which have no circular stripes. This type is restricted to some domesticated animals and never occurs in wild forms. The arrangement of stripes varies greatly within the same species and even in the two halves of the body. The author attempts to correlate the stripes with the folds in the skin at various stages of growth. The arrangement and direction of skin folds in the new-born rabbit, for instance, resembles closely the stripes of type 1.

—*A. H. Schultz.*

Fischer, E. Ueber die Variationen der Hirnfurchen des Schimpansen. Verhandl. d. anatom. Ges., Ergzh., vol. 54, Anatom. Anz., pp. 48–54. 1921.

A study of the fissures in 26 well preserved brains of chimpanzee from the interior of Cameroon. The most interesting result is the conclusion that the brain of the chimpanzee is fully as variable as that of the white man. As in the human brain, the Sylvian fissure in chimpanzee is longer on the left side than on the right; only four brains showed a reverse relation.

—*A. H. Schultz.*

Alexander, C. P. The crane-flies of New York, Part II. Mem. 38, Agric. Exp. Stat., Cornell Univ., p. 721. June, 1920. (Larvæ of crane-flies are said to be eaten by foxes on the Pribilof Islands when other food is scarce. The European mole is reported to eat many crane-fly larvæ and it is believed that other moles, shrews, and mice take part of their food from this source.)

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——— Joel Asaph Allen. Science, n.s., vol. 54, pp. 397–402. October 28, 1921. (An account of the life and work of Doctor Allen, 1838–1921.)

——— Preliminary report on Ecuadorean mammals. No. 1. Amer. Mus. Novit., no. 20, pp. 1–6. November 3, 1921. (Describes *Icthyomys tweedii*, *Blarina montivaga*, *Anoura geoffroyi antricola*, and *Cœnolestes caniventer*, spp. nov.; and *Neusticomys monticolus*, gen. et sp. nov.)

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Bailey, Bernard. An addition to the mammalian fauna of Minnesota. Fins, Feathers and Fur, no. 27, p. 8. September, 1921. (Records *Perognathus flavescens perniger* from Sherburne County.)

Beckwith, Cora Jipson. Note on a peculiar pancreatic bladder in the cat. Anat. Rec., vol. 18, no. 4, pp. 363–367. May 20 (June), 1920.

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——— Death to the rodents. Yearbook U. S. Dept. Agric., 1920, separate 855, pp. 421–438. 1921. (Account of some of the work of the Biological Survey.)

BISHOP, SHERMAN C. The Temple Hill (Orange County, N. Y.) mastodon. Science, n.s., vol. 54, p. 170. August 26, 1921.

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